LOTUS

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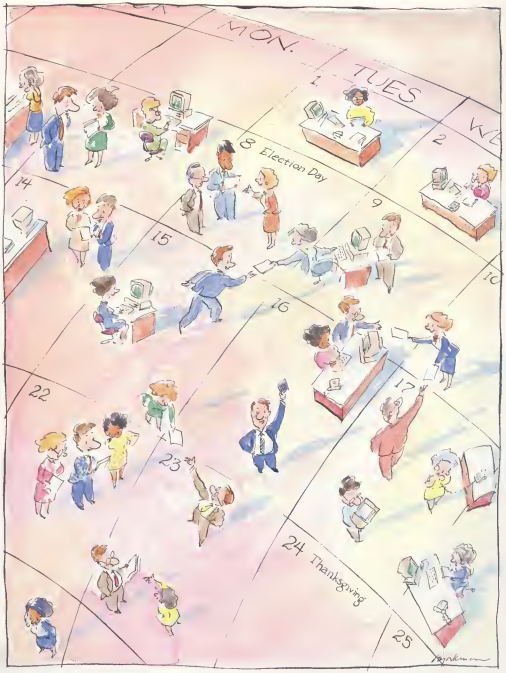
COMPUTING FOR MANAGERS AND PROFESSIONALS



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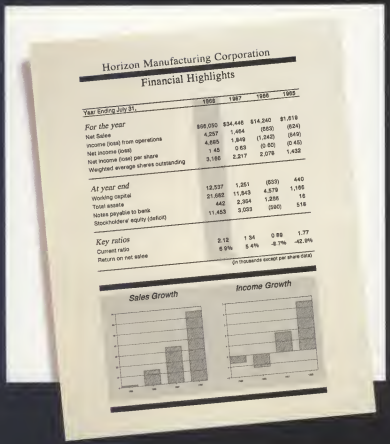

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Financial Highlights

Year Ending July 31,	1968	1967	1966	1965
For the year				
Net Sales	$66,050	$34,446	$14,240	$1,518
Income (loss) from operations	4,257	1,464	(950)	(624)
Net income (loss)	4,695	1,849	(1,242)	(649)
Net income (loss) per share	1.45	0.63	(0.60)	(0.45)
Weighted average shares outstanding	3,166	2,917	2,078	1,432
At year end				
Working capital	12,537	1,251	(639)	440
Total assets	21,662	11,843	4,579	1,166
Notes payable to bank	442	2,364	1,259	16
Stockholders' equity (deficit)	11,453	3,003	(990)	518
Key ratios				
Current ratio	2.12	1.34	0.89	1.77
Return on net sales	6.9%	5.4%	-8.7%	-42.8%

(in thousands except per share data)

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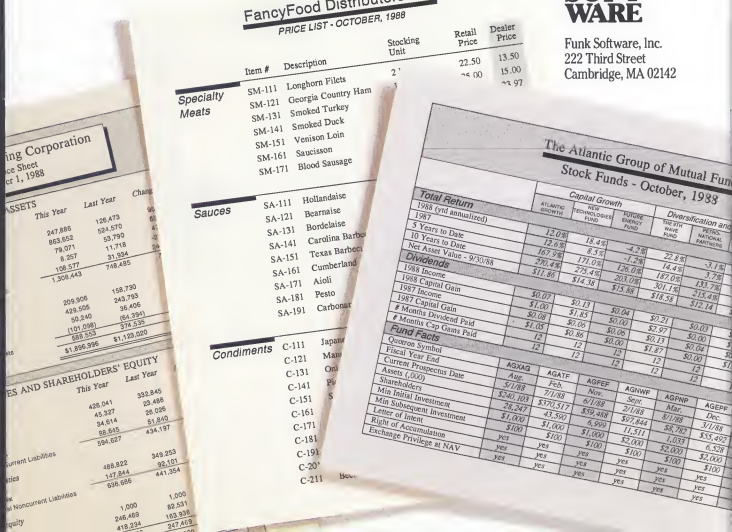

LOTUS

COMPUTING FOR MANAGERS AND PROFESSIONALS

2 STAFF LETTER

6 LETTERS

9 IDEAS & TRENDS
IBM Blues; 3-D Data; Little LANs; New Graphics Adapter; Emulation Software; Shorts

26 @LOTUS

MACROS

28 1-2-3 MACROS
Menu Alternatives
BY DANIEL GASTEIGER

37 SYMPHONY MACROS
Getting Around
BY DANIEL GASTEIGER

DEPARTMENTS

44 ACCOUNTING
Keep Afloat with a Sinking Fund
BY STEPHEN L. NELSON

49 PERSONAL FINANCE
When 10% Isn't 10%
BY DONALD C. DIXON

RESOURCES

77 Q&A

89 GOOD IDEAS

96 DATA TRANSFER
Hot Line Two and *Lotus Express*
BY MARC DAVIDSON

100 REVIEWS
Software: *Bookmark, Maxi*Save,* and *SOS*
BY MARC DAVIDSON
Software: *Oracle for 1-2-3*
BY WILLIAM LAWRENCE
Software: *Spreadsheet Shortband*
BY JUDY HOUSMAN

109 NEW PRODUCTS

110 ADVERTISER INDEX

111 READER SERVICE CARD

111 EDITORIAL EVALUATION

FEATURES

54 4 JOB SCHEDULES
Choose the one that matches your priority.
BY EVERETTE S. GARDNER JR.

60 AGENDA: 'IT WORKS THE WAY I THINK'
Early users of *Lotus Agenda* are finding new ways to organize the flow of information across their desks.
BY JEFFREY N. BAIRSTOW

66 ANALYZE YOUR DATABASE . . . SELECTIVELY
The @D functions simplify the job.
BY PETER G. AITKEN

72 DON'T SQUANDER MEMORY
These 11 tips help you squeeze more into RAM.
BY PAULA DEMPSEY

118 ESSAY
Predicting Election Results with *1-2-3*
BY DANIEL SELIGMAN

COVER: STEVE BJÖRKMAN

66 Use the @D functions to analyze selective database records.

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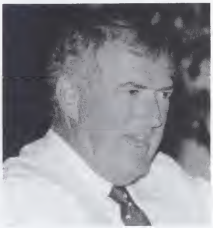
STAFF LETTER

PICKING UP WHERE DAN LEFT OFF

We in publishing pay some attention to mastheads, but chances are that you don't. So you may not be aware of some important changes here over the past couple of months.

The most important change is that Daniel A. McMillan, who created this magazine and stalwartly guided it through its first three and a half years, has given up the reins in favor of golf,



travel, and other lures of retirement. The buck now stops with me.

All of us who live this magazine, as well as those who merely see it as a valuable tool, owe a lot to Dan. A journalism graduate, a business manager, a magazine publisher, a top executive at McGraw-Hill and International Thomson Organization, a deeply caring person—Dan put all this together when he came to Cambridge in 1984 to start Lotus Publishing Corp.

The challenge was twofold: First, to produce a magazine that would provide ongoing, practical help to an important group of computer users. Second, given our corporate relationship, to maintain our integrity and independence. Dan believed strongly that we could succeed only if you saw clearly that we were not a house organ.

Dan and Chris Morgan, our first editor, met that challenge. They were helped immensely by the support they got from Mitch Kapor, Jim Manzi, and the rest of Lotus Development Corp.'s top management.

I got to know Dan when we were both at International Thomson, and I came here to work with him last spring. Dan has been a good teacher, and I'm pleased that he will continue to advise and consult with us.

There are some new faces around here as well. One is that of John B. Campbell, our editorial director. John has spent almost four decades in business publishing, as a writer, an editor, and a manager. He is also a longtime user of *1-2-3* and a charter subscriber to this magazine.

The other new faces are those of Assistant Editors Mark Scapicchio and Nicholas Delonas. Mark comes from Lotus Development Corp.'s Developer Marketing Group, where he edited the {*For Developers*} newsletter. He will work with Resources Editor Dick Ridington. Nick just got his master's in MIS from Boston University, after previously earning an MBA at that school. He will work with Macros and Technical Editor Daniel Gasteiger.

Mark and Nick represent staff additions. So, as you can see, we continue to build on the idea that Dan McMillan made real in 1985. He will be around here often enough so that we won't be able to do otherwise.

Mark D. Flanagan
President/Publisher
Lotus Publishing Corp.

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ELIZABETH MURPHY

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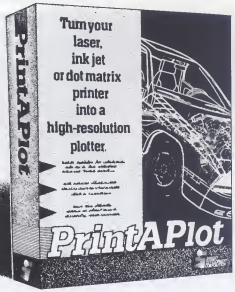

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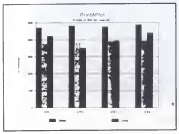

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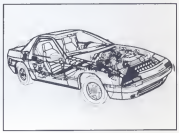

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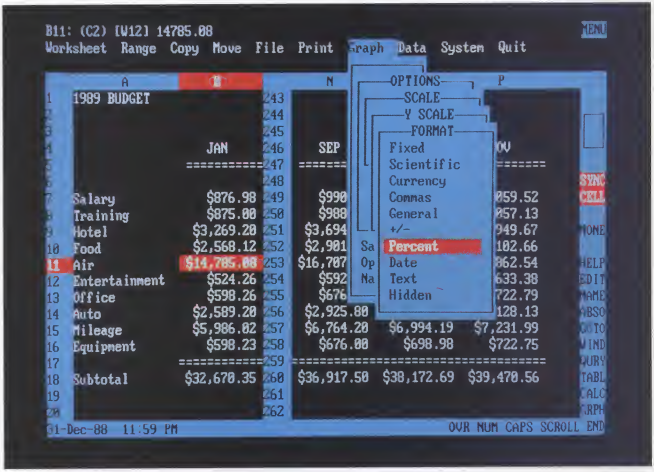

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WHITHER SYMPHONY?

As an owner of *Symphony* Release 1.2, I am not pleased with the early news about Release 2. I feel that Lotus has orphaned *Symphony* users by not incorporating into the new release many of the desirable improvements that are going into new versions of *1-2-3*. The apparent lack of an "undo" function, the lack of a search-and-replace feature in the spreadsheet format, and the inability to load multiple spreadsheets are regrettable omissions. At the very least, Lotus should offer *Symphony* owners the option of switching back to *1-2-3*.

Finding that one nifty add-in program after another works with *1-2-3* but not with *Symphony* is another gripe of mine. I have been a pretty loyal Lotus user for some time, but rather than paying for a *Symphony* upgrade that doesn't really have what I'm looking for or forking out a lot of money for a new version of *1-2-3*, you may find me buying one of the competitor's spreadsheets.

James A. Lewis
Columbia, Mo.

We have both *1-2-3* and *Symphony* on our network, but our department uses only *Symphony*, for its database capabilities and its ability to save named print and database settings sheets. *1-2-3* Release 3 sounds like a good thing, especially with the three-dimensional feature, but we want assurance that if we go to Release 3 we won't lose the features we like in *Symphony*. More fundamental, does Release 3 represent a merging of *1-2-3* and *Symphony*, or is it an extension of *1-2-3* that will be matched in the future by similar improvements in *Symphony*?

Rebecca Sielman
Milliman and Robertson, Consulting Actuaries
Bloomfield, Conn

Editor's note: *We forwarded these letters and others asking similar questions to Lotus Development Corp. Following is the response from Philippe Goetschel, senior product marketing manager:*

Thank you for your inquiries regarding the future of *Symphony*. We always appreciate hearing from the readers of *LOTUS* magazine.

Lotus has no plans at all to merge *Symphony* and *1-2-3* strategy and development. Quite the contrary. We are committed to the future of *Symphony*, which is Lotus's second largest product, right behind *1-2-3*. We have more than a million *Symphony* users worldwide, making it the biggest selling integrated package.

Clearly, we want to support these customers—and we will. *Symphony* Release 2.0 is one measure of that commitment. There will be others.

The new features in Release 2.0 are based on what customers have told us they most wanted. We balance adding features with keeping performance strong and memory requirements down. That is why we cannot include all the features of *Lotus HAL* or other *1-2-3*–compatible products.

We do have a new policy in place at Lotus not to talk about or announce any new products we are working on. Since new versions of *Symphony* fall into this category, we cannot answer your questions with specifics. However, we can ask for your suggestions and actively consider them for future versions. If you would like to share your thoughts, please send them to me, Philippe Goetschel, at: Lotus Development Corp., 55 Cambridge Pkwy., Cambridge, MA 02142.

@IF YOU DON'T NEED IT

I believe author Pat Lee missed William Gourlie's point in the Letters column [August], which referred to "Super Sorts in Release 2" [February]. To illustrate, Lee's formula @IF(E6=E$16,C$20, C$20+E$16−E6) is really equivalent to @IF(E6=E$16,C$20+E$16−E6, C$20+E$16 −E6).

In other words, if the condition is true, that is, if E6 is equal to E$16, then the argument that follows would give the result equal to C$20, because E6 and E$16 "wash out."

Of course, this second formula is ab-

surd because the *x* and *y* arguments are the same. Therefore, the whole @IF statement could be rewritten, as Mr. Gourlie suggested, simply as +C$20+E$16−E6. This will give the same result as the original @IF statement.

John Tija
Mt. Vernon, N.Y.

The author replies: *Thanks to Mr. Tija and the many other readers who wrote defending Mr. Gourlie's original letter, which is correct. I apologize for the oversight.*

WHEN #AND# MEANS *

In "With Sincere Depreciation, Part 2" [July], two methods are used to express the first argument in two @IF functions. The formulas in cells I39 and J39 both check if certain conditions are met. Cell I39 uses multiplication and cell J39 uses the logical operator #AND# to check this.

Are there differences, say in speed or storage requirements, between the two approaches?

Ronald J. Linder
Delagnes, Mitchell & Linder, Certified Public Accountants
San Francisco, Calif.

Editor's note: *In the formulas you mentioned, #AND# and * are equivalent. There is no significant difference in memory use or calculation speed, but we could have saved four keystrokes and been consistent by using the multiplication symbol in both cases.*

The @IF function tests to see if the value of the opening argument is true, that is, not equal to Ø. When the argument contained two expressions connected by the logical operator #AND#, that meant "if expression1 *and* expression2 *are BOTH not equal to Ø...." When the argument contained two expressions connected by a multiplication symbol, that meant "if the product of* expression1 *and* expression2 *is not equal to Ø...." In either case, if either expression equaled Ø, the result of the opening argument would be Ø.*

WEIGHTED AVERAGES AND DOUBLE ENTRIES

In Part Four of the Small-Business Series, "The Check Register" [August], the formula in cell K20 for the average ending daily balance is incorrect. This formula averages the entries made in the spreadsheet without accounting for the number of days between entries, which is also a factor in the calculation. Suppose you had only two entries for June, which resulted in a balance of $1,000 on June 1 and $100 on June 30. The author's computation would produce an average balance of $550, whereas the correct balance is (29*1,000+1*100)/30, or $970.

Also, entering both the check amount and the distribution into expense categories is redundant and prone to error. Rather, enter the distribution only, and let *1-2-3* add the amounts and make entries into column D. If the amount in column D is subsequently checked against the invoice you are responding to, this provides some safeguard against typing errors.

Charles M. Horton
Southington, Conn.

The author replies: *Sorry, I should have pointed out that the average cash balance formula gives you a simple average rather than a weighted average, which Mr. Horton's formula provides. This formula and the other checkbook statistics were included as an enhancement and demonstration of the sorts of things you can do with the Lotus statistical functions.*

You're right that double-entry bookkeeping is extra work, but its purpose is to minimize error. Entering the data in two sections builds some cross-checking possibilities into the model.

Letters to the editor should be sent to Letters Editor, LOTUS *Magazine, P.O. Box 9123, Cambridge, MA 02139-9123. Letters may be edited for length and clarity.*

@ERR

"A Decision Maker's Guide to Databases" [August]: The *Directory of Online Databases* is published by Cuadra/Elsevier, P.O. Box 1672, Grand Central Station, New York, NY 10163-1672; 212-916-1180. The on-line version is called the Cuadra Directory of Databases.

In Q&A item "Combining and/or Logic" (September), for the formula to evaluate correctly in every scenario, it must contain parentheses as shown below:

@IF(B1>1000#AND#(C1>3
#OR#C1<1),B1,Ø)

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The bottom line is that Symphony is one high performance package that's made to be opened up.

Lotus Symphony 2.0

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IBM'S MARKET SHARE FALLS

Big Blue struggles to establish its PS/2 Micro Channel machines.

For a year and a half, IBM has been promoting its new PS/2 line of personal computers with the zeal of a television evangelist, touting it as the "next generation" in desktop hardware that is "right for today, ready for tomorrow." Although the world's leading computer maker has shipped more than three million PS/2 machines, evidence is mounting that the crusade is faltering.

IBM's share of domestic and foreign computer markets is slipping, and surveys show that many potential customers are unimpressed with the new machines. In addition, IBM's competitors refuse to make a standard of the PS/2's proprietary Micro Channel bus architecture and have formed a consortium to develop a new bus standard. The main reason is that, although IBM's MCA supports multitasking and multiprocessing, it is incompatible with existing plug-in add-on boards. Therefore, IBM, which has dominated the PC marketplace throughout the 1980s, appears to be struggling for the first time.

"They've been making mistakes," says Bruce Stephen, an analyst with International Data Corp. (IDC), a market research firm in Framingham, Mass.

One mistake was to grossly underestimate the sales life of the IBM PC AT. The AT clones are outselling IBM's MCA machines by nearly 3 to 1, according to SoundView Financial Group, a market research firm in Stamford, Conn. Big Blue's marketing strategy has also failed to convince the public that its PS/2 line is technologically superior to its competitors' products. In addition, a recent sales-quota system for IBM dealers backfired and, in effect, forced dealers to discount heavily to meet quotas and pushed them toward competitive

BOB ZUBA

brands with higher profit margins.

"The only people buying Micro Channel products are in companies where employees wear only blue underwear and write only in blue ink," says Seymour Merrin, a computer consultant at Merrin Resources in Southport, Conn. He adds, "It's a core constituency—those who buy only IBM. But that core doesn't grow; it only shrinks."

IBM, of course, accentuates the positive. Spokesman Jim Monahan says that its new machines, including the MCA models, are "unqualified successes" and that the PS/2 line is "the fastest-selling computer line in IBM's history."

RECENT POLLS OF CORPORATE PC BUYERS SPELL TROUBLE FOR BIG BLUE.

However, even though IBM is selling a lot of PS/2s, studies show IBM losing U.S. market share, dropping from 37% last year to an estimated 33% in 1988. IBM's Monahan says that those figures provide "an incomplete picture" because they don't reflect overseas shipments, direct sales, or sales through value-added resellers. In addition, says Monahan, 1987's higher market-share figure is skewed because it includes sales of discontinued models. According to market research firm Dataquest (San Jose, Calif.), which tracks worldwide personal-computer sales through all outlets, IBM's total market share for 1988 will be 18%—reflecting a 1% drop from last year.

The bad news for IBM is that there's reason to believe its competitors' machines will continue to outsell the PS/2 line. In July, for example, 134,000 computers that are compatible with older-style machines, such as the IBM PC, the PC XT, and the PC AT, were sold versus 49,000 IBM computers with the MCA, according to StoreBoard, a Dallas company that measures U.S. retail sales of computer equipment. Sales of IBM PC–compatible computers climbed 30% overall from July 1987 to July 1988, with sales of AT-compatible machines jumping 50%, says Joanne Stahel, StoreBoard's president.

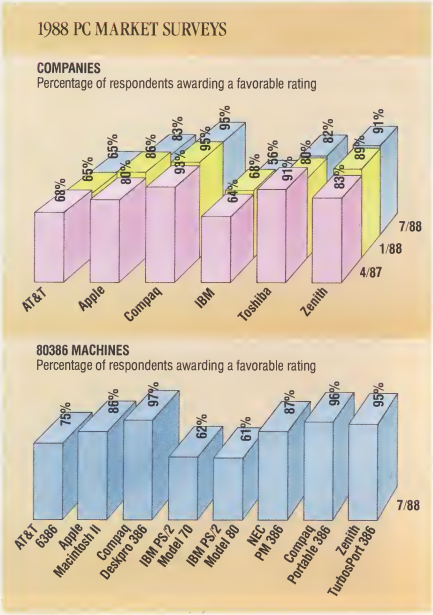


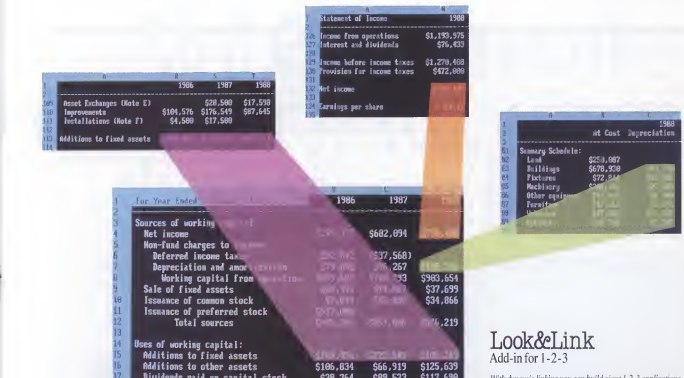
ILLUSTRATION: DAVE HANNUM SOURCE: TECHTEL CORP

Recent polls of corporate PC buyers spell further trouble for Big Blue. Techtel Corp., a market research firm in Orinda, Calif., found in July that among the corporate buyers surveyed, IBM was the least popular among seven major computer manufacturers, with only 56% of the respondents holding a positive opinion of the PS/2 line. By contrast, 95% of the respondents awarded a favorable rating to Houston-based Compaq Computer Corp. "The current market perception is that IBM's PS/2s are not better machines," says Michael Kelly, Techtel's president.

Kelly blames the problem on IBM's advertising, which he thinks does not address why customers should buy the new computers. "The main message tends to be that [the computers] have good features," he says. "The market doesn't respond to that stuff. It's just inane."

Disappointment factor

Perhaps even more ominous for IBM is International Data Corp.'s finding that IBM's customer-satisfaction ratings are eroding. "There has been a disappointment factor," says IDC's Stephen. People thought the PS/2 line would be better than IBM's previous models and the compatible computers in terms of performance, ease of configuration, and reliability. However, Stephen says that so far people have not equated the MCA



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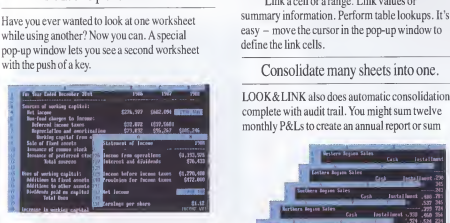

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For IBM, the problems with its PS/2 line come at a time when the company has been hoping for a turnaround. In response to declining earnings, John F. Akers, IBM's chairman and chief executive officer, announced in February 1987 a complete restructuring of the company's sales and marketing forces and a new commitment to customers. Two months later, IBM unveiled the new PS/2 line and the proprietary Micro Channel architecture.

The MCA improves the way data flows between a computer's main processing unit and its peripherals, but it also serves as a response to clone makers who copied IBM's earlier models and grabbed the low-end PC market. By creating a new standard that can be copied only under a royalty agreement, IBM hopes to regain control of the market. So far, the strategy isn't working, analysts say. "[IBM's] error was in thinking that the market had not changed since the late '70s and early '80s," computer consultant Merrin says.

The clone makers have not rallied around IBM's new bus. Only a handful of companies have signed licensing agreements for the MCA. Moreover, in September, a consortium of IBM's competitors, including Compaq and Tandy, announced plans to develop a new 32-bit bus architecture, called EISA (Extended Industry Standard Architecture), that they claim will offer most of the features of the MCA but will remain compatible with older add-on boards. Computers sporting the EISA bus aren't expected until next year. Such a move was inconceivable a few years ago when IBM's competitors closely matched Big Blue's every move.

Backhanded compliment

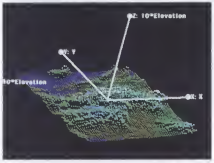
IBM says the consortium's announcement is a backhanded compliment. "It's an acknowledgment by these companies that customers want the performance benefits of the Micro Channel," says IBM's Monahan. However, several independent analysts regard the consortium's announcement as the strongest evidence to date that IBM has lost control of the marketplace.

Despite IBM's setbacks with the PS/2 line, Jim Weil, a microcomputer analyst with SoundView Financial Group, thinks IBM still has at least a nine-month window during which to sell the public on the virtues of its MCA while the alternative bus design is under development. Says Weil: "We can't write the epilogue yet." —*Steve Stecklow*

EXPLORING DATA IN THREE DIMENSIONS

Ferret out hidden relationships.

Scientists and engineers have long used three-dimensional computer-graphics techniques to explore the relationships, patterns, and peculiarities within data that are impossible to see by looking at columns and rows of numbers. These 3-D graphics programs



A 3-D topographical map created in *MacSpin*

do more than add the visual punch of a cubelike effect to bar charts or of shadows to exploded sections of pie charts. They plot data in all three dimensions: horizontal, vertical, and depth.

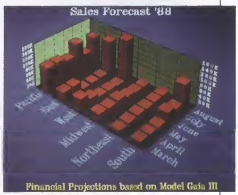
Now business and financial analysts are discovering 3-D graphics:

- Mark Greene, assistant director of research for the Federal Reserve Board in Washington, D.C., uses 3-D graphics for long-range forecasting. It takes only two dimensions to show the rate of inflation in different commodities. "But," says Greene, "if we want to show how that rate changes over time, we're talking about three dimensions." By plotting time on the X (horizontal) axis, commodities on the Y (vertical) axis, and inflation on the Z (depth) axis, Greene's staff can show the commodities inflation rate changing over time.
- At New York's Chemical Bank, Rush Taggart, systems vice president in Global Securities and Foreign Exchange, is looking into using 3-D graphics to study Treasury bond yields over time. "We can do a 2-D line chart at any instant on the current market," he says, "but with 3-D graphics we could use time as the Z dimension." The result would be a picture composed of wavy lines, with the lines farthest away representing the oldest data. Each time the chart is updated, the old yield curve would be pushed farther back.
- For Bizhan Azad, a senior economic analyst at the Boston Redevelopment Authority, 3-D graphics is "like looking at a combination of three snapshots." The charts Azad's department creates include such variables as the number of people employed in particular industries over a period of time and the number of people employed by industries located in particular Boston zip code areas. "We try to show the economic pulse of the city," he explains.

"With three dimensions, you get a whole new appreciation of the interaction of data," says Dr. Joel Orr. Orr is chairman of consulting firm Orr Associates (Great Falls, Va.) and a specialist in computer-graphics applications.

Currently, most 3-D graphics programs run on sophisticated workstations. Greene's staff, for example, uses a network of Sun workstations to create its charts, which reflect a traditional approach to 3-D data. However, a few programs are starting to filter down to personal computers, and some of these use the third dimension in a more unusual way: to plot three variables represented by a single point that lies within a three-dimensional space. The result is an interactive, dynamic, 3-D scatter plot.

Two programs for the Mac, *MacSpin* ($300, from D^2 Corp., Austin, Tex.) and *Data Desk Professional* ($495, from



***Perspective Junior* turned raw data into this 3-D sales forecast.**

Odesta, Northbrook, Ill.), can produce interactive, dynamic 3-D scatter plots. This capability is also available to some extent in *Perspective Junior*, a program

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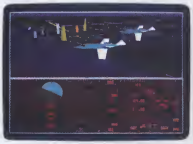

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for the IBM PC ($149, from Three D Graphics, Pacific Palisades, Calif.).

Although all three programs work with imported spreadsheet data, *Perspective Junior* was designed for presentation graphics and is the least facile at plotting points defined in space by three coordinates directly from spreadsheet columns. *Data Desk* and *MacSpin*, on the other hand, have roots in statistical analysis and were designed with data exploration and analysis in mind.

Seeing the third dimension

By way of illustration, imagine a 2-D scatter plot that shows assets versus sales for 500 companies. In this plot, a dot represents each company. The horizontal, or X-axis, location of each dot is determined by the company's assets; the vertical, or Y-axis, location, by its sales. The result is a cloud of dots from the lower left to the upper right of the plot area. Companies with high levels of assets and sales are clustered at the top right, while those with low assets and sales congregate at the bottom left.

A third variable might be the market value of the companies' stock. When this variable is plotted on the depth, or Z, axis, companies with low market values move to the foreground, and those with high market values move to the background—without changing their horizontal and vertical positions.

To see the third dimension, however, you must rotate the image. When you rotate the scatter plot, the two-dimensional cloud of data points becomes a three-dimensional galaxy, and patterns begin to emerge. "Imagine looking straight on at two tennis balls, one in front of the other," says Dr. Paul Velleman, a Cornell University statistics professor and author of *Data Desk Professional*. "When you turn them around so that they're side by side, you see that there are two, and you can begin asking questions about them, such as 'How are they different?' "

WITH THREE DIMENSIONS, YOU GET A WHOLE NEW APPRECIATION OF THE DATA INTERACTION.

For example, rotating an image might reveal a previously hidden dot that represents a company with assets and sales in the same 2-D range as other companies, but with a stock value that's disproportionately low or high. Such a company might be particularly interesting to an investor. You could probably find the same company by comparing a series of 2-D charts, but not as quickly or as dramatically.

It takes practice to see the complex relationships that 3-D graphics can reveal. Many 3-D charts are too visually complex to be easily understood by people who are unfamiliar with the data. Nonetheless, for people making decisions based on complex relationships in never-ending streams of data, 3-D graphics may be irresistible. "It's just a question of when we'll get the time to add 3-D graphics to our systems," says Rod Beckstrom, president of C-ATS Software (Palo Alto, Calif.), a

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company that designs and markets software for trading systems worldwide. "The world's ready," he adds.

If Beckstrom is right, as 3-D graphics software becomes better known and more readily available to the business and financial communities, exploration graphics could become as popular as presentation graphics. "I wouldn't be surprised," says Orr, "to see 3-D graphics features in *1-2-3* or *Microsoft Excel* within a year." —*Barbara Robertson*

LITTLE LOCAL AREA NETWORKS

Sometimes small LANs are better than big ones.

Contrary to popular opinion, most corporations do not buy local area networks that connect PCs to mainframes and to thousands of users. According to the market research firm Creative Strategies Research International (Santa Clara, Calif.), only 5% of the 300 Fortune 1000 companies it recently surveyed were interested in using networks to share databases and programs. Instead, more than 80% of the surveyed companies used smaller, so-called sub-LANs to share expensive peripherals, such as large hard disks and laser printers.

As the name might suggest, sub-LANs, or little LANs, offer less data-transmission capacity and are slower than large, companywide networks. However, they carry significantly lower installation and administration costs. Little LANs cost between $90 and $500 for each network connection, or node, as compared with $600 to $2,000 per node on larger LANs from IBM, 3Com, and Novell.

Finding the right solution

Sub-LANs come in a variety of shapes and sizes. For example, Digital Products (Watertown, Mass.) President Cornelius "Pete" Peterson describes his company's offering, NetCommander Sub-LAN, as a data switch that has its own processor and memory for file sharing. Specialized software lets users share printers, modems, files, and tape-backup units.

If, on the other hand, you need to link many users so that they can exchange mail and files and gain access to larger databases, then a large LAN is the only solution. Large LANs are usually server-based networks, which keep programs and data files together on a central hard disk. Most sub-LANs are peer-to-peer networks in which each PC node has its own set of files that only one user can retrieve at any given time.

In fact, for its own operations, Digital Products needed the extra speed and capacity of a large LAN. Peterson bypassed his company's sub-LAN product and installed a Novell network in his customer-service department. "The eight-node Novell network costs about $1,870 per node, compared with about $430 per node for NetCommander," Peterson says. "And the Novell network's complexity makes the training and ongoing support costs higher."

One of the best-selling sub-LANs is made by Tops (Alameda, Calif.), a company recently acquired by Sun Microsystems (Mountain View, Calif.). Tops claims to have shipped 300,000 network nodes to date. The Tops peer-to-peer network includes operating software and boards that connect IBM PCs and compatibles, Apple Macintoshes, and some Unix-based systems into one network. This capability is increasingly important but can be a mixed blessing because the Tops operating software leaves only a little more than 400K of memory for applications, a potential problem for users of *1-2-3*, *dBase*, or other large programs or files.

Like most sub-LANs, the Tops sub-LAN uses inexpensive, twisted-pair telephone wires that connect to each networked computer's serial port. This structure eliminates the need for the $300 to $700 hardware adapters and the higher-priced, difficult-to-install coaxial cable often required by regular LANs.

Inexpensive two-person LAN

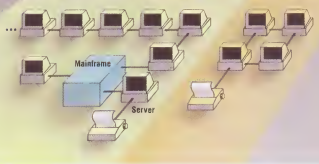
Desk-Link, from Traveling Software (Bothell, Wash.), is the smallest sub-LAN, connecting only two PCs. That may seem overly restrictive, but Jon Scott, Traveling Software's vice president of sales and marketing, claims the company is selling several thousand units a month.

Desk-Link provides a rudimentary form of electronic mail and allows the connected PCs to share files and printers. When it operates in expanded memory, Desk-Link uses only 31K of DOS's 640K memory maximum. The two PCs are connected with a 25-foot cable attached to their serial ports. At less than $170 for a two-node network, Desk-Link qualifies as one of the least expensive, and least expansive, of the little LANs.

Since the needs of many users will

LAN CHARACTERISTICS

CHARACTERISTICS	LANS	SUB-LANS
Data transmission (in bits per second)	1M to 10M bps	100K to 500K bps
Number of workstations	Thousands	2 to 30
Cost	$600 to $2,000/node	$90 to $500/node
Distance between nodes	Measured in miles	100 to 3,000 feet
Configuration	Server-based	Peer-to-peer
Support/training	Extensive	Limited
Administration required	Network administrator	Key operator



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ultimately surpass the confines of the immediate work group, most vendors have designed sub-LANs with bridges to large LANs. These bridges, or gateways, make it relatively easy for users to tap into databases and other files on minicomputers and mainframes. For this reason, as well as for their ease of use and low cost, sub-LANS are a useful solution, even if you may eventually need large-LAN capabilities.

—Richard Dalton

IBM'S NEW 8514/A GRAPHICS ADAPTER

Clears a path for driverless software and peripherals

Two years ago, IBM's Enhanced Graphics Adapter (EGA) brought acceptable color graphics to IBM PCs and compatibles. EGA displays, with their 640-by-350-pixel resolution, were soon eclipsed, first by the higher 640-by-480-pixel resolution of IBM's Video Graphics Array (VGA) board, then by super VGA-type boards from other companies, which have resolutions of 800 by 600 pixels and higher.

Now, perhaps, a more permanent standard is quietly in the making. IBM's 8514/A Display Adapter, introduced with little fanfare when the company brought out its PS/2 line of computers, is beginning to spawn clones of its own. The 8514/A outdoes even the most capable VGA boards. Like some super VGA adapters, it delivers high-end resolution: 1,024 by 768 pixels. Unlike the super VGAs, however, it can display 256 colors (from a palette of 262,144) at that resolution.

True, boards that equal or outclass the 8514/A in graphics performance already exist. However, most are designed for workstations dedicated to a single, graphics-intensive application, such as desktop publishing, computer-aided design, or image processing.

The real significance of IBM's 8514/A is not its colors and high resolution but the fact that it is designed around an application programmers' interface. The API, which operates between the graphics hardware and the applications software, provides a common denominator for software developers. Any application written to the API standard will run on any graphics hardware that supports the interface, no matter what the resolution. Similarly, any peripheral driver that responds to the API will work with any system that runs graphics

ANATOMY OF A HIGH-RESOLUTION MONITOR

High-performance color monitors are still pricey items. Up to the IBM 8514/A's level of graphics, mass-market economies and relatively simple engineering have made color monitors affordable. The basic multifrequency monitor, such as the one pioneered by NEC, provides fine displays of EGA- and VGA-level graphics. However, these monitors begin to falter at higher frequencies.

Like garden-variety color TVs, the lower-performance graphics monitors use an interlaced vertical-scanning mode: They scan every other line on each pass and fill in the intervening lines on the next pass. However, when vertical-scanning frequencies approach 50 Hz, as they must to take advantage of higher-resolution graphics adapters, the interlaced mode results in annoying screen flicker. IBM's 8514 monitor is an interlaced monitor, but it uses a special phosphor that retains an image long enough to reduce the flicker.

The higher-performance noninterlaced monitors scan every line on each pass. These monitors are considerably more expensive, partly because the demand for them is less. However, they also generally use 19-inch or larger cathode-ray tubes, which are exponentially more costly to produce than the smaller tubes used in most interlaced monitors.

Jon Peddie, an Oakland, Calif., market analyst who specializes in high-resolution graphics boards, believes that prices of high-resolution monitors will drop as the market for them increases. He also believes that as new high-definition TV (HDTV) technology reaches the consumer market, and currently expensive monitor components are produced in greater volumes, the cost of high-end monitors will come down further. *—T.M.*

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based on the API standard.

EGA and VGA boards, on the other hand, are register-level devices, which means that software must be written specifically to support them. This puts a burden on software developers, who must write drivers to support the devices they think their customers want to use. Each new generation of register-level graphics boards must also be downward-compatible so that they work with software written for the previous generation of graphics boards.

Jon Peddie, a market analyst from Oakland, Calif., who specializes in high-resolution graphics boards, says it's smarter for graphics hardware companies to design a graphics adapter around an API. This eliminates the need for software companies to write a driver for every peripheral and for users then to wade through menus looking for the right driver to install.

1-2-3 Release 2.01, for example, contains roughly 50 peripheral drivers. You must select the appropriate drivers during *1-2-3*'s Install procedure. If you change, say, from a printer to a plotter, and you didn't originally install a plotter driver, you must rerun the Install program and select a different driver. "Now the burden is back where it belongs, on the peripheral manufacturers," Peddie says. "They have to support the software interface."

Sharing the burden

In the absence of an API, the software developer's burden also applies to developers of register-level graphics boards, who must either write drivers to support specific applications or persuade the software developer to do so. This can have a stifling effect on software development, since graphics boards tend to support only the most popular programs. New programs, even if they are clearly better, often fail to get the graphics-hardware support they need to succeed in the market—a classic catch-22 situation.

IBM's willingness to make its API specifications available to other hardware and software companies is not entirely altruistic, say industry observers. If its API is adopted as a standard and gains the support of leading software developers and peripheral manufacturers, IBM will be free to change or improve its graphics hardware virtually at will, as long as it conforms to the API. A standard API would free the market from the sort of confusion that occurred when IBM switched from EGA to VGA, forcing software and peripheral manufacturers to scramble to keep up.

Ripe for a standard

The market for high-resolution graphics adapters is ripe for a standard. According to Peddie, 59 companies offered a total of 89 high-resolution boards last year. This year 94 companies are offering a total of 195 high-resolution boards. Annual sales of high-resolution boards, says Peddie, now approach $160 million.

However, not everyone needs 1,024-by-768 resolution with 256 colors. Peddie thinks that today's dedicated spreadsheet user will "probably be best served by the super VGA boards." These products, which are already rolling out in mass-market volumes from such companies as Orchid Technology and Everex Systems, are essentially VGA boards with a souped-up clock speed and expanded video RAM. Some even deliver a resolution of 1,024 pixels by 768 pixels, but generally only with four colors. At that resolution you can display a year's worth of spreadsheet columns on one screen at a cost of about $1,000 for the board and monitor.

THE API PROVIDES A COMMON DENOMINATOR FOR SOFTWARE DEVELOPERS.

Once you go beyond the super-VGA level, board and color-monitor costs skyrocket. The high cost of video-RAM chips drives up the prices of these memory-intensive boards, and the higher-resolution monitors also cost more. IBM, for example, charges $3,110 for its display subsystem that consists of the 8514/A Display Adapter, the 8514 Monitor, and the required memory-expansion kit. However, if you do a lot of computer-aided-design work or produce color presentation graphics, that higher investment is essential.

—Tom McMillan

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Lotus 1-2-3

(1) Upgrade offer valid September 6, 1988 through 30 days after the 1-2-3 Release 3 ship date. (2) National Software Testing Laboratories, Inc. Software Digest Ratings Report, June, 1988
(3) 1-2-3 system requirements will vary from Release 2.01 to Release 3. 1-2-3 Release 3 runs under DOS and OS/2. Hard disk and 640K required. Lotus-certified compatible PC with 80286 processor or better recommended
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RUN 1-2-3 ON A MAC II

Emulation software moves programs to disparate systems.

As long as there are different types of computers, the problem of compatibility will continue to be a thorny one. What do you do when you need to run *1-2-3* or some other MS-DOS–based PC application on your Mac or on your Unix workstation? If you have a popular hardware system, you can probably find system-specific applications that do what your DOS applications do. But the training and setup time involved, not to mention the problems of transferring your existing data files, can make that route more trouble than it's worth.

Several companies offer an alternative: emulation software. These programs emulate one computing environment in an ostensibly alien system. They operate between your hardware's microprocessor and operating system and your otherwise incompatible applications program. And at least one company sells a compiler that converts a program designed for one operating system to one that runs under another.

1-2-3 spreadsheet running on a Macintosh

Most emulation software is, understandably, for use with MS-DOS programs. And most MS-DOS emulation software is designed to run on computers based on the Motorola M68000 series of processors—mainly Unix workstations from such companies as Sun Microsystems, Apollo Computer, and NCR Corp.

The Macintosh is also a 68000-based machine, but you can't currently run PC programs on any Macintosh except the Mac II. Phoenix Technologies' (Norwood, Mass.) MS-DOS emulation software runs on 68000-series processors and could conceivably be put to work in the Macintosh Plus or Mac SE. At present, however, Phoenix offers a Mac version of its emulation software only for the 68020 microprocessor, so unless you have a Mac II, you'd need to replace the 68000 processor in your Mac Plus or Mac SE with an expensive 68020 add-in board.

In the near-absence of emulation software for the Mac, AST Research (Irvine, Calif.) offers a hardware alternative. Its add-in boards let you run DOS software on the Mac SE and Mac II (see box, page 22).

The reverse process—running Mac programs on a PC—is currently impossible because Apple hasn't licensed the Mac's operating system to anyone. Although it's technically possible to develop a software clone that would run

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under MS-DOS and emulate the Macintosh's operating system, most observers think Apple would come down hard on anyone who actually created one.

John Wardley, a Macintosh analyst for the market research firm International Data Corp. (Framingham, Mass.) agrees that "Apple would be distressed" to see the Mac operating system emulated on MS-DOS machines. And Craig Elliott, Apple's marketing manager for MS-DOS–OS/2 integration, confirms that "a number of legal questions" would be involved.

Motorola's 68020 chip, the 68000's more powerful sibling, is playing a major role in software emulation. The 68020's extended instruction set allows emulation software to be written for it more easily and compactly.

Insignia Solutions (Sunnyvale, Calif.) markets *SoftPC*, a $595 emulation program that lets the 68020-based Macintosh II and 68020-based Unix systems such as the Sun-3 run MS-DOS programs. Developed by a team of British computer scientists, the program is written in a combination of C and assembly languages. It emulates the Intel 8086 microprocessor and the IBM BIOS (basic input/output system). The company claims to have eliminated the problems, primarily lack of speed, previously associated with emulation software.

A different approach

Hunter Systems Software (Mountain View, Calif.) has eliminated some of the same problems by developing a non-emulation approach to running MS-DOS software on Unix systems. Rather than emulating the IBM PC or PC AT processor, its software, called *XDOS*, actually converts MS-DOS programs such as *1-2-3* into 68020 low-level machine code. The result is a "new" program that runs directly on 68020-based Unix systems.

Along with the *XDOS* "binary compiler" ($250), you must purchase a "key file" ($50 each) specifically written for the MS-DOS program you want to convert. Hunter Systems sells key files for the leading MS-DOS word-processing, spreadsheet, desktop-publishing, database, and computer-aided-design packages. A Hunter spokesperson says the firm has also developed a version of *XDOS* for the Macintosh II but currently has no plans to offer it commercially.

Hunter's president, Colin Hunter, claims *XDOS*'s results are superior to those produced by software emulators because the newly compiled version "runs like a good Unix program." He says that *XDOS*-converted applications run up to seven times faster on a single-user system than the original programs run under most emulation software. For example, Hunter says that when *1-2-3* runs under emulation software, it continually polls the keyboard, which is "a waste of processor time" under Unix on a multiuser system.

If you're beginning to wonder how many computer users really go for emulation programs, you're not alone. Analyst Wardley says, "I don't think they're selling." Wardley believes that, although some Mac users buy emulation software to run applications not otherwise available, more often salespeople use it as a way to convince PC-fixated corporate buyers to buy Macs.

John Dunkle, vice president of The Aberdeen Group, a Boston computer-market research firm, calls emulation

programs "a kludge, an interim solution." He says, "It's silly to buy an Apple to run *1-2-3*." Apple's Craig Elliott says emulation software essentially turns a Macintosh into a "pretty ugly IBM PC XT," although he believes it has its place, especially when a Macintosh user needs to run a specialized application not available for the Mac.

Problem may go away

Wardley, Elliott, and Dunkle agree on one thing: Most users are more concerned with data-file compatibility than with the ability to run MS-DOS software on a Mac or on a Unix system. That is, they want to be able to transfer data files generated on a PC to a Mac or Unix environment and vice versa.

Dunkle bravely predicts that the whole file-compatibility problem will resolve itself. By the early 1990s, he says, we'll see applications that run identically under any computing environment. And despite the current legal brew between Apple and Microsoft over the "look and feel" of *Microsoft Windows* 2.03 (see the May 1988 issue of *LOTUS*, page 11), Dunkle thinks Apple will eventually license its user interface, resulting in a common, industrywide graphical interface that may even encompass OS/2's Presentation Manager.

Once this happens, Dunkle predicts, developers will hasten to write and market applications for that common interface instead of for specific hardware, as they do now. If this occurs, and some argue strongly that it never will, emulation software will become an anachronism. —*Stan Miastkowski*

HARDWARE SOLUTIONS

While emulation software is the state of the programmer's art for running software on a foreign system, hardware solutions are a more straightforward—though more expensive—answer to compatibility problems.

When Apple introduced the Macintosh SE and Macintosh II last year, AST Research (Irvine, Calif.) announced add-in boards, codeveloped with Apple, that allow both Macs to run MS-DOS applications. For Macintosh II owners, the $1,599 Mac286 is a two-board set that plugs into the Mac II's NuBus. The product, which has an 80286 processor, essentially puts the equivalent of an IBM PC AT running at 8 MHz inside the Macintosh. The $599 Mac86 does the same for the Macintosh SE, providing an 8086 processor and the associated electronics on a board that plugs into the SE's expansion slot.

Even hardware emulators aren't always simple to produce, however. An AST spokesperson says that development problems with the video driver delayed the release of the Mac86 until this fall, nearly a year beyond its originally scheduled delivery date.

While Commodore Amiga 500 and 1000 owners currently can't run MS-DOS applications on their machines, Commodore offers a hardware option for running MS-DOS applications on the Amiga 2000. The $699.95 Bridgeboard plugs into an expansion slot in the 2000 and adds the hardware equivalent of an IBM PC XT with an 8088 processor running at 4.77 MHz.

For ultimate hardware compatibility, Japan is currently the place to watch. VM Technologies (Tokyo), a joint venture of several major Japanese computer companies, is developing what it hopes will be a universal microprocessor, one that can act like any commonly used microprocessor. Such a product would be to microcomputers what type O blood is to the human body.

The key to this supercompatibility is the chip's microcode, the very low-level program that coordinates the tens of thousands of microscopic components on a typical microprocessor. Currently, the microcode is permanently burned into the chip, but VM Technologies hopes to develop a programmable chip so that you'll be able to load the microcode for whatever microprocessor you want the chip to act as. You'll also be able to change it later to work as a different microprocessor.

VM Technologies expects to start shipping samples of the chip to hardware developers by the end of the year, though it's too early to tell when commercial products based on it will start to appear. —*S. M.*

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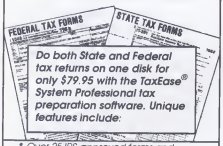

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SHORTS

JOHN SCULLEY FOR PRESIDENT?

Presidential straw polls are a dime a dozen right about now, but when Apple computer users overwhelmingly choose cartoon character Roger Rabbit for president over John Sculley, Apple's president and chief executive officer, that qualifies as news of sorts. The poll was conducted at a Macintosh computer show in Boston this summer.

Not surprisingly, most of the votes went to Michael Dukakis (58%) and George Bush (32%). However, Sculley received 12 votes, trailing not only Roger Rabbit (52 votes) but also entertainer Pee-Wee Herman (34 votes); the former mayor of Carmel, Calif., actor Clint Eastwood (31 votes); and Chrysler Chairman Lee Iacocca (17 votes).

—Rich Friedman

CATCHING ALL THOSE SPLIT INFINITIVES

Are your metaphors mixed? Do your modifiers dangle? The next generation of grammar-checking programs can tell you. These programs use rule-based, expert-system techniques that enable them to parse sentences—that is, to break sentences into their grammatical elements so that each word and phrase can be understood in context.

Sentence-parsing capabilities are available in two recently released programs: *Grammatik III* ($99, from Reference Software, San Francisco) and *RightWriter* 3.0 ($95, from RightSoft, Sarasota, Fla.).

The ability to recognize a sentence's syntax means that, in addition to spotting repeated words and incorrect spelling, punctuation, and capitalization, these programs can identify more subtle grammatical gaffes: subject-verb and noun-pronoun agreement errors, split infinitives, incorrect possessives (who's/whose, it's/its), and incorrect homonyms (there, their, they're). They can also recognize typographical errors such as transposed letters (from/form) and missing letters (*you* instead of *your*). And although no grammar program can turn you into a great literary stylist, both programs can highlight jargon, sexist language, and redundant or overused phrases.

This month, Reference Software is releasing the *Grammatik Utility Pack* ($39), which is available either separately or bundled with *Grammatik III Professional* ($139). The *Utility Pack* adds a RAM-resident mode and a phrase editor that can help you design style guides for specialized writing needs.

—Jennifer Smith

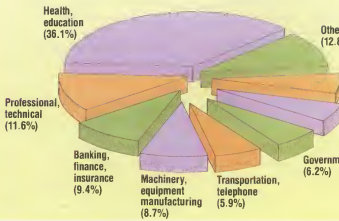
WHO HAS THE MOST PCs?

As of the beginning of this year, 11.5 million PCs were in use outside the home—a 44% increase from last year. These figures come from Comtec Market Analysis Services, a subsidiary of Gartner Group, the Stamford, Conn., market research firm. Comtec's 1988 report, called *Wave Five*, is based on a survey of about 8,000 businesses, nonprofit organizations, and government agencies.

The report estimates that medical and educational institutions account for more than 36% of the total number of installed PCs, and two thirds of those are installed at primary and secondary schools. Other industry groups with significant shares of installed PCs include the professional and technical services, such as architecture, engineering, and research and development (11.6%); banking, finance, and insurance (9.4%); machinery and equipment manufacturing (8.7%). The government accounts for 6.2% of installed PCs; about 51% of government agencies used PCs at the start of 1988, up more than 9% from last year.

—J. S.

INSTALLED PCs BY INDUSTRY, 1988



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Lotus Graphwriter II

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—Mark D. Flanagan, Publisher

LOTUS DELAYS 1-2-3 RELEASE 3 AGAIN

In early October, Lotus Development Corp. announced that *1-2-3* Release 3, formerly scheduled to ship in the fourth quarter of this year, is now expected to ship in the second quarter of 1989.

"A single Release 3 version is up and running under both DOS and OS/2, and we've met a number of other key technology challenges," said Frank King, senior vice president of the Software Products Group. "We've overcome the major hurdles, and we're now working on fixing the bugs and fine tuning the product." The additional time, King said, is necessary to make absolutely sure that Release 3 meets Lotus's standards for quality, performance, compatibility, and portability.

ALLWAYS GIVEAWAY

Lotus is giving away a copy of *Allways*, a $149.95 spreadsheet-enhancement program from Funk Software (Cambridge, Mass.), with every copy of *1-2-3* Release 2.01. Participating Lotus-authorized dealers are distributing *Allways* free to purchasers of *1-2-3* Release 2.01 while supplies last, Lotus says.

Allways turns a *1-2-3* spreadsheet into a graphic, WYSIWYG (what-you-see-is-what-you-get) display. Among other capabilities, the program lets you use eight fonts on a page (in sizes from 5 to 24 points), vary row heights, draw boxes around worksheet ranges or titles, dress up a worksheet with underlining and shading, and incorporate graphs (PIC files) into your spreadsheets.

FREELANCE PLUS UPGRADE

Next month Lotus Development Corp. will ship a major upgrade of *Freelance Plus*, its stand-alone graphics package. Feature enhancements in *Freelance Plus* 3.0 include improved charting capabilities; new ways to plan, organize, and create presentations; a facility for displaying presentations on a PC screen; and additional drawing and editing tools. Modifications to the user interface, the context-sensitive help, and the documentation make the program easier to use, Lotus says.

Freelance Plus 3.0 shares common fonts with the forthcoming *1-2-3* Release 3 and can import and export both worksheet and graphics files from Release 3. In addition, *Freelance Plus* 3.0 can import and export TIFF files (a graphics file format).

The program runs on the IBM PC XT, PC AT, 3270 PC, PS/2, and certified compatible computers. It requires 640K of RAM, a hard disk, DOS 2.0 or higher, and a Hercules Monochrome Graphics Adapter or IBM CGA, EGA, VGA, MCGA, or XGA.

Freelance Plus 3.0 has a suggested retail price of $495. The upgrade charge is $100 to registered *Freelance Plus* users and $150 to registered *Freelance* users. There is no upgrade charge to those who purchase *Freelance Plus* between September 6 and 30 days after the new version ships. For more information, call 800-TRADEUP.

GRAPHICS TIPS

The Lotus Focus on Graphics Series is a set of five instructional booklets designed to help personal-computer users communicate more effectively using business graphics.

The booklets are for first-time computer-graphics users and for those who want to increase their graphics skill level, says Tim Davenport, director of Lotus's Graphics Products Division.

The five 50-page booklets are *Creating Text Charts*, which is devoted exclusively to the creation of text charts; *Selecting the Right Chart Type*, a guide to choosing the best chart to represent different types of data; *Making Better Presentations*, a guide to building an effective presentation; *Enhancing Business Graphics*, which explains how to turn charts into attention-grabbing graphics; and *Communicating Visually*, which describes how to express messages effectively with diagrams, concept charts, and maps. The Focus on Graphics Series is available through Lotus Selects (800-635-6887) for a suggested retail price of $29.95. ■

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CIRCLE 113 ON READER SERVICE CARD

DOING MORE FOR THE DATA PROCESS™

1-2-3 MACROS

MENU ALTERNATIVES

Use these techniques in Releases 2 and 2.01 when the /XM, {MENUBRANCH}, and {MENUCALL} commands just aren't enough.

BY DANIEL GASTEIGER

Large macro-driven applications usually rely heavily on menus. These menus let you control what the macros do. For example, a check-recording macro might offer options to enter amounts of checks written, to enter deposits made, to print the current account balance, to print the month's transactions, and so on.

Last month's column explored the /XM, {MENUBRANCH}, and {MENUCALL} commands, which let your macros display custom menus in the control panel. However, sometimes those custom menus don't meet your needs. Standard macro-generated menus are limited to eight choices and may force you to create cumbersome menu trees. Fortunately, there are several alternatives to the /XM, {MENUBRANCH}, and {MENUCALL} commands.

A WORKSHEET-SIZE MENU

One alternative to the classic moving-pointer menu is to list menu items in the worksheet and have your macro display the list as a menu. The macro in the following illustration demonstrates one of these menus by helping you to set the disk directory in which *1-2-3* stores data:

```
     A        B        C        D        E        F
1   \0       {END}{HOME}{PGDN}
2            {GOTO}choices~{DOWN 2}{RIGHT}
3            {?}{LET dir,@CELLPOINTER("contents")}
4            /FD{IF @RIGHT(dir,1)<>"\"}c:\
5            {dir}~/WEY
6
7   dir
8
9
10  choices  Point to a directory name and press Return:
11
12                    Ed       Charlotte
13                    Wilbur   Fern
14                    Audrey   Stuart
15                    Bertha   Templeton
16                    A:\      C:\
```

The macro's design assumes that there are eight people who share a single computer and that the computer's hard disk contains a directory named after each of the users. To create the macro, enter the labels in columns A, B, and C as shown. Remember to begin each of the entries in cells A1 and B4 with an apostrophe label prefix. Also replace the names and drive specifiers in range C12..D16 with names of directories and drive specifiers specific to your computer. Then assign the labels in column A as names for the adjacent cells of column B: Select /Range Name Labels Right, and indicate range A1..A10. Finally, save the worksheet.

Notice that we named the macro *\0*. You can't start such a macro from within the worksheet that contains the macro. Rather, when you retrieve a worksheet that contains a macro named *\0*, *1-2-3* starts running the macro automatically once the worksheet is in memory. To see how this works, select /File Retrieve and retrieve the file you just saved.

The macro kicks in the moment the worksheet is loaded. Here's what the macro does:

{END}{HOME}{PGDN} Sends the cell pointer to the lower-right corner of the worksheet's active area, then moves the cell pointer down one screen's depth. This assures that you'll be looking at a blank part of the worksheet.

{GOTO}choices~{DOWN 2}{RIGHT} Sends the cell pointer to the cell named *choices*, then moves the pointer down two rows and one column to the right. This step causes *1-2-3* to display the message *Point to a directory name and press Return* in the top-left corner of the screen. This step also places the cell pointer on the first of the names in the list of directory names.

{?}{LET dir,@CELLPOINTER("contents")} Causes the macro to pause, then copies the current cell to the cell named *dir*. The {?} command suspends macro processing until you press Return. You can move the cell pointer to any cell on the worksheet and even access *1-2-3*'s menu while the macro pauses. However, in this application you should do as the on-screen instructions state: Point to the name of the directory you wish to make current, and press

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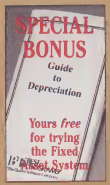

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Return. When you press Return, the {LET} command assigns the value of the formula @CELLPOINTER ("contents") to the cell named *dir*. This effectively copies the contents of the current cell to *dir*.

/FD{IF @RIGHT(dir,1)<>"\"}c: Presses slash, selects File Directory, then determines whether to type the characters *c:*. When the macro selects /File Directory, *1-2-3* prompts for the name of the directory to make current. At that point, the {IF} command determines whether the rightmost character of the label in *dir* is a backslash. The absence of a backslash shows that you didn't point to a drive specifier (A:\ or C:\) in the list of directory names. When there is no backslash, the macro begins to indicate a directory name by typing *c:*, then control passes to the commands in cell B5. When the last character of the label in *dir* is a backslash, macro control passes directly to the commands in cell B5; the macro doesn't type *c:* as part of the directory specification.

{dir}~/WEY Types the directory name you specified and presses Return, then erases the current worksheet. The {dir} command in this step calls the cell named *dir* as a subroutine. *Dir* contains a copy of the directory name that you highlighted a moment earlier, so this command makes the macro type a directory name in response to *1-2-3*'s /File Directory prompt. Once the directory is current, the macro selects /Worksheet Erase Yes and leaves the worksheet blank.

FOR LARGE APPLICATIONS

The previous application makes full-screen menus seem quite powerful. In fact, for many applications you can't design simpler menus. When you add a new directory to the hard disk, you can provide access to that directory simply by adding its name to the list in the worksheet. Likewise, you can erase directory names from the worksheet when you remove the corresponding directory from the disk.

Some more intricate applications also can use these unbounded menus. The illustration at the top of the next column shows a menu that provides access to nine procedures. Each of those procedures is only a part of a much larger application.

To create this macro, enter the labels as shown. Remember to begin with a label prefix when you enter the labels in cells A1 and B4. Also begin with a label prefix when you enter each of the labels in range D10..D18. You'll find that if you don't start with a label prefix, typing a less-than sign (<) accesses *1-2-3*'s main menu.

After you enter the labels, select /Range Name Labels Right and indicate range A1..A28. This assigns the labels in column A as names for the adjacent cells of column B. The macro is ready to try.

Before you run the macro, note that we've omitted the actual routines for each of the menu selections

```
     A        B        C        D        E        F
1   \m       {END}{HOME}{PGDN}
2            {GOTO}choices~{DOWN 2}{RIGHT}
3            {?}{LET rout,@CELLPOINTER("contents")}
4            /XG{rout}~
5
6   rout     Graphs
7
8   choices  Point to an action and press Return:
9
10                    Update   <-enter day's transaction
11                    Sort     <-sort database
12                    Week     <-print totals for week
13                    Month    <-print totals for month
14                    Quarter  <-print totals for quarter
15                    Graphs   <-update all graphs
16                    PIC      <-create graph files
17                    Find     <-examine specific records
18                    Summary  <-extract selected records
19
20  Update   {BEEP}
21  Sort     {BEEP}
22  Week     {BEEP}
23  Month    {BEEP}
24  Quarter  {BEEP}
25  Graphs   {BEEP}
26  PIC      {BEEP}
27  Find     {BEEP}
28  Summary  {BEEP}
```

and assigned all of the names of the routines to adjacent cells of column B. When you run the macro and make a selection, your computer will beep once for each of the items in the menu, beginning with the one you selected. Start the macro by holding down the MACRO key (Alt on most computers) and pressing M. Here's what happens:

{END}{HOME}{PGDN} Moves the cell pointer to a clear part of the worksheet.

{GOTO}choices~{DOWN 2}{RIGHT} Moves to the menu on the display and moves the cell pointer to the menu's first item.

{?}{LET rout,@CELLPOINTER("contents")} Pauses until you make a selection, then copies your selection to the cell named *rout*.

/XG{rout}~ Transfers macro control to the routine whose name appears in *rout*—the routine you selected from the menu. The /XG command is equivalent to the {BRANCH} advanced macro command. Its syntax is /XG*routine name*~, where *routine name* identifies the routine to which macro control should pass. In this macro, *routine name* is the subroutine call {rout}. It causes the /XG command to behave as though the contents of the cell named *rout* fall between the characters */XG* and the tilde.

THE LIMITATIONS

As easy as these menus are to create and modify, they have some serious limitations. Two of the problems are related: *1-2-3* must be in Ready mode to access these menus, and the cell pointer must move from the cell it occupies to the menu area.

You just have to live with the first problem and use these large menus only when the macro can access

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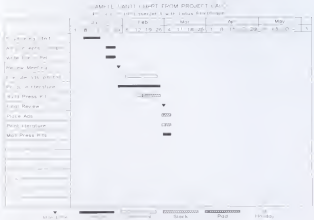

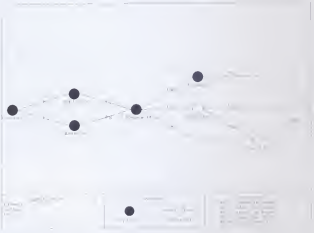

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1-2-3 MACROS *continued from page 30*

them from Ready mode. The way to work around the second problem is to start the macro's menu routine with a command that stores the current address of the cell pointer. Then, just after the user makes a selection, the macro can move the cell pointer back to where it started.

To modify our sample macro, change the contents of cell B1 to read {LET curcell,@CELLPOINTER ("address")}{END}{HOME}{PGDN}. Also change the entry in cell B4 to read {GOTO}{curcell}~/XG {rout}~. Finally, use the Worksheet Insert Rows command to insert two rows at row 8, enter the label *curcell* into cell A8, and then use the Range Name Labels Right command to assign the name *curcell* to cell B8.

There is one other problem you should consider when you use this technique to present menus. When a macro pauses at a {?} command, the user has access to the entire worksheet. During the pause you can move the cell pointer to any cell, access menus, and modify the worksheet. Someone who doesn't follow directions could accidentally damage the worksheet and bring your macro to a crashing halt.

MACRO LETTERS

PRESERVING PAGINATION

We use a worksheet to produce quotations with as many as seven benefits. Not all quotations use every benefit, so I've designed a macro that will print only the parts of the worksheet that are relevant to a given quotation. Each of the worksheet ranges has an indicator cell that contains a nonzero value when that range should print. The problem is, *1-2-3* doesn't paginate the output correctly.

You can see in the following excerpt that the macro accesses the Print menu several times, then quits from the menu to test the status of one of the indicator cells. If the indicator cell has a nonzero value, the macro reaccesses the Print menu to print another range:

```
     A        B        C        D        E        F        G
403 \z       /RNCcounter~c398~
404          {GOTO}counter~+counter+1~
405          {HOME}/PPA~Ra73.G96~LLLLLLLLLLLLLLLLGPQ
406          {IF d121>0}/PPRa100.i125~LLLLLLLLLLGPQ
407          {IF d146>0}/PPRa130.i146~LLLLLLLLGPQ{RECALC c398}~
408          {IF d173>0}/PPRa155.i173~LLLLLLLLGPQ{RECALC c398}~
409          {IF counter<>3}{BRANCH a412}
410          {GOTO}counter~+1~{GOTO}counter~+counter+1~
411          /PPPQ
412          {IF d200>0}/PPRa182.i200~LLLLLLLLGQ{RECALC c398}~
413          {IF counter<>3}{BRANCH a416}
414          {GOTO}counter~+1~{GOTO}counter~+counter+1~
415          /PPPQ
416           . . . etc.
```

I'd like *1-2-3* to continue printing and to use the next page number in sequence, but apparently selecting Quit from the Print menu resets the page counter to one. Is there a way to rewrite the macro to get around this problem?

Bernard Ouimet
Sun Life of Canada
Montréal, Canada

The Editor replies: Your macro doesn't need to drop out of the Print menu to test the contents of the indicator cells. The {IF} command can assess a cell's contents from almost any point in *1-2-3*. For example, change the code in cell B405 of your macro to read as follows:

{HOME}/PPARa73.G96~LLLLLLLLLLLLLLLGP

Then enter the following code in place of the commands in cell B406:

{IF d121>Ø}Ra100.i125~LLLLLLLLLLGP

Similarly replace the code in cell B407 with:

{IF d146>Ø}Ra130.i146~LLLLLLLLGP{RECALC c398}

You get the idea. But let's look at a few other things you could change in this macro.

The command in cell B403 assigns the name *counter* to cell C398. There's no need for this. After you run the macro, *counter* remains assigned to cell C398, but *1-2-3* reassigns the range name each time you run the macro. When you create a macro, you should manually assign every range name that the macro requires to run. By assigning range names in advance, you can eliminate one line of macro code for each range name.

The commands in cell B404 send the cell pointer to *counter* and enter a formula that contains a circular reference. The macro uses *counter* as a counter cell, recalculating the circular reference to increase its value by one after printing one of the selected ranges. This technique is cumbersome.

Use {LET} commands to change the value of *counter*. For example, to reset the value of *counter* to zero, use the command {LET counter,Ø}. To increase the value of *counter* by one, use the command {LET counter,counter + 1}. In neither case must the cell pointer move from its current location.

Finally, get those cell and range addresses out of your code. You've named cell C398 *counter*, but many of the macro steps refer to that cell by its address. If those references were to the cell's name, deciphering the code would be much easier. You could also assign range names to each of the print ranges your macro uses. Your code could reveal at a glance what each print range contains. Even the indicator cells that you mentioned could have range names to better identify the print ranges to which they belong. ■

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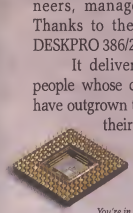

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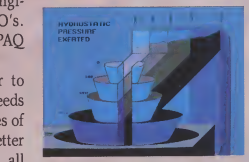

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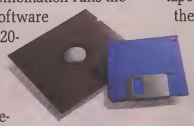

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SYMPHONY MACROS

GETTING AROUND

Use these techniques to move the cell pointer about on the worksheet.

BY DANIEL GASTEIGER

During a work session, you probably don't have much trouble deciding where to move the cell pointer. Your macros, however, can't make decisions that are as sophisticated as the ones that you make. You have to decide in advance where the cell pointer needs to be, then write macros that move the pointer accordingly. Fortunately, there are many tools to help direct your macros' control of the cell pointer.

STRAIGHT-LINE NAVIGATION

The macro commands that you'll use most often to move the cell pointer are keywords for the cursor-movement keys. Each key on the cursor-control keypad has an equivalent macro command keyword. For example, the macro equivalent of the DownArrow key is the {DOWN} command. The greatest workhorse macro of all time uses the {DOWN} command to help with data-entry chores by moving the cell pointer down one row each time you enter data:

	A	B	C	D	E	F
1	\d	{?}~				
2		{DOWN}				
3		{BRANCH \d}				

To create the macro, enter labels as shown, then assign *\d* as the range name for cell B1. To assign the name, select MENU Range Name Labels Right, and indicate cell A1.

To try out the macro, move the cell pointer to cell B5, hold down the MACRO key (Alt on most computers), and press D. Other than the appearance of the *Macro* indicator at the bottom of the screen, nothing noticeable happens. However, the macro processor is in control, and *Symphony* is waiting for you to press the Return key. You may type any characters. When you press Return, the macro presses Return, then moves the cell pointer down. This enters the characters you typed into the current cell.

Once the cell pointer has moved down, the macro restarts. It pauses until you press Return, then moves the pointer down, and so on. The macro continues until you press the Break key (on most computers, hold down the Control key and press Break) and clear the resulting error by pressing Escape or Return.

SHORT JUMPS

The following table shows the cursor-movement commands matched to each of the cursor-movement keys that they represent:

{UP}	UpArrow
{DOWN}	DownArrow
{LEFT}	LeftArrow
{RIGHT}	RightArrow
{PGDN}	PageDown
{BIGDOWN}	PageDown
{PGUP}	PageUp
{BIGUP}	PageUp
{HOME}	Home
{END}	End
{BIGRIGHT}	Control-Right (hold down Control and press RightArrow)
{BIGLEFT}	Control-Left (hold down Control and press LeftArrow)

Note that the PageUp and PageDown keys each have two keyword equivalents. Either is valid in any macro.

Each macro keyword can accept one argument to indicate how many times the keyword should "press" the key in question. For example, the macro command {DOWN 3} causes the macro processor to press the DownArrow key three times.

Four simple utility macros let you make the cell pointer jump from place to place on the worksheet:

	A	B	C	D	E	F
5	\i	{UP 3}				
6						
7	\j	{LEFT 3}				
8						
9	\k	{RIGHT 3}				
10						
11	\m	{DOWN 3}				

To create these macros, enter labels as you did for the previous example. Then use the MENU Range Name Labels Right command to assign the labels in column A as names for the adjacent cells of column B.

With these macros in a worksheet or in a Macro Library Manager library, you can move the cell pointer quickly by holding down the MACRO key and pressing I, J, K, or M. Note that the arrangement of the I, J, K, and M keys on your keyboard coincides with the direction that each of the associated macros moves the cell pointer. For example, the I key is the uppermost key in the group, and pressing MACRO-I causes the cell pointer to jump up three cells in the worksheet. Using these keys to move the cell pointer will quickly become second nature.

OTHER TOOLS FOR CELL HOPPING

The previous group of macros helps you make short jumps across the worksheet. Several other techniques let your macros provide big jumps. One quick route across the worksheet involves pressing the End key followed by one of the Arrow keys. In a blank worksheet, pressing End followed by RightArrow moves the cell pointer to column IV—the rightmost column of the sheet. Likewise, pressing End followed by DownArrow moves the cell pointer to the last row of the worksheet—row 8192.

When the worksheet contains entries, the outcome of pressing the End key followed by an Arrow key depends on the location of the entries relative to the cell pointer. The cell pointer in the following illustration rests in cell B2:

	A	B	C	D	E	F
1						
2		data	data	data		
3		data	data	data		
4		data	data	data		
5		data	data	data		
6						
7						
8		data	data	data		
9		data	data	data		
10		data	data	data		
11						

When you press End followed by DownArrow, the cell pointer jumps to cell B5—the last contiguous data-filled cell. When you press End-DownArrow a second time, the cell pointer jumps to cell B8—the next cell that contains data in the column. Across a series of empty cells, the End-Arrow key sequence sends the cell pointer to the next cell that contains data. Across a series of filled cells, the End-Arrow key sequence always sends the pointer to the last cell that contains data.

Macros can use the {END} command to trigger these cell-pointer long jumps. Frequently, you need a jump when your macro adds a new row of data to an existing range of values. The macro in the following illustration sends the cell pointer to the bottom of the range named *data* (B18..C22). Then the macro pauses so that you can make an entry in the blank cell below *data*. When you press Return to finish your entry, the macro moves the cell pointer one cell to the right and stops so that you can make a second entry.

	A	B	C	D	E	F
13	\e	{GOTO}data~				
14		{END}{DOWN 2}				
15		{?}~{RIGHT}				
16						
17						
18		Item	Quantity			
19		Trucks	2			
20		Pads	12			
21		Straps	10			
22		Boxes	89			

To try the macro, enter labels and values as shown, then assign the name \e to cell B13 and use the MENU Range Name Create command to assign the name *data* to range B18..C22. Move the cell pointer to a blank area, then press MACRO-E.

This macro showcases two methods of moving the pointer around the worksheet. The {END}{DOWN 2} command sequence works as if it read {END}{DOWN}{DOWN}. It moves the cell pointer from one end of a range of data to the other, then moves the pointer one row below the range. The macro also uses the {GOTO} command, which is equivalent to your pressing the GOTO key, to send the cell pointer to the top-left corner of any predetermined range.

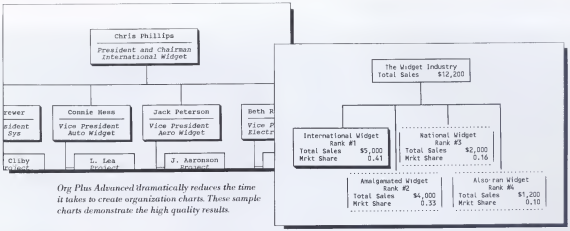
The following macro shows another application of the {GOTO} command. It presses the GOTO key, then presents a menu that lists the named cells and ranges of the worksheet. When you point to one of the names and press Return, the macro sends the cell pointer to the top-left corner of the range you selected.

	A	B	C	D	E	F
24	\g	{GOTO}{MENU}{?}~				

Create this macro as you did the others: Enter the labels and assign the label in column A as the range name for the adjacent cell of column B. Run the macro by pressing MACRO-G.

NAVIGATING WITHIN A RANGE

Once the {GOTO} command delivers the cell pointer to a range, your macro usually needs to move the pointer to specific cells associated with the range. We've seen how to move the pointer within a range to the last of the contiguous cells that contain data. However, if any cell within the range is blank, your macro needs another strategy to find the end of the range. Once more, the arguments allowed in the cursor-movement command keywords come in handy.



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The arguments you use within movement keywords aren't limited to raw values. They can also consist of cell references, range names, or formulas that resolve to values. The {DOWN} command in the following macro uses a formulaic argument to move the cell pointer to the cell below the leftmost column of *main_db* (A30..C33). This macro delivers the cell pointer to the target cell even though an entry is missing from column A of *main_db*:

```
      A        B        C        D        E        F
26  \b       {GOTO}main_db~
27           {DOWN @ROWS(main_db)}
28
29
30  First    Last     Extension
31  Fred     Hanks    3388
32           Johnson  8848
33  Sandy    Watson   6280
```

Create this macro as you did the others, and assign the name *\b* to cell B26 and the name *main_db* to range A30..C33. Run the macro by pressing MACRO-B.

Of course, pressing the DownArrow key once for each row of the target range is slow going. Suppose that this three-column database grows to be several hundred—or thousand—rows deep. You could wait minutes for the cell pointer to reach its destination. On the other hand, your macros could use the following routine to find the bottom-left corner of long databases:

```
      A        B        C        D        E        F
36  \l       {MENU}RNCmain_db~
37           {LET targ,@CELLPOINTER("address")}
38           {ESC 7}{GOTO}{targ}~
39           {DOWN}{LEFT @COLS(main_db)-1}
40
41  targ
```

To create the routine, enter labels as shown into the worksheet that contains the database you created for the last example. Use the MENU Range Name Labels Right command to assign the names *\l* and *targ*, then give the macro a try. Here's what happens when you press MACRO-L:

{MENU}RNCmain_db~ Begins to reassign the range name *main_db*. By selecting MENU Range Name Create and entering *main_db*, the macro causes *Symphony* to highlight the entire target range. That range remains highlighted when macro control passes to the commands in cell B37.

{LET targ,@CELLPOINTER("address")} Assigns to the cell named *targ* the result of the formula @CELLPOINTER("address"). This formula returns the address of the bottom-right corner of the database range, which is the cell diagonally opposite the anchor cell of the highlighted area.

{ESC 7}{GOTO}{targ}~ Presses Escape seven times to abort the range-naming procedure, then moves the cell pointer to the cell address stored in *targ*. The macro could just as easily finish the range-naming procedure by pressing Return instead of Escape. However, *Symphony* recalculates the worksheet when you assign a range name. Aborting the range-naming procedure eliminates the recalculation and makes the macro run faster.

{DOWN}{LEFT @COLS(main_db) − 1} Moves the cell pointer down and over to the cell below the leftmost column of the database.

A FEW OTHER JUMPS

Sometimes the data your macros work with don't fall entirely within a single named range. In cluttered worksheets especially, you need a way to get the cell pointer just below the last filled cell in the sheet. Even when the pointer must cross several ranges of data to reach the target cell, this jump is a snap.

The macro commands in the following illustration move the cell pointer to the cell below the last entry in the current column:

```
      A        B        C        D        E        F
43  \u       {END}{PGDN}{END}
44           {UP}{DOWN}
```

Another navigation problem that sometimes arises is the need to move the cell pointer to a specific column within the current row. For example, a macro might let you make entries in any of three cells in any row of the worksheet. When you finish making entries, the macro needs to move the cell pointer to column D of whatever row is current. Here are the steps to make this jump:

```
      A        B        C        D        E        F
46  \r       {LET coltarg,+"D"&@STRING(@CELLPOINTER("row"),0)}
47           {GOTO}{coltarg}~
48
49  coltarg
```

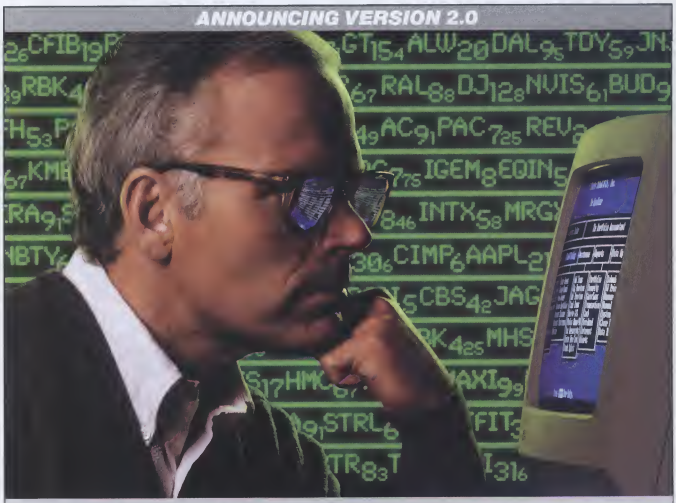
The first step of this routine assigns to the cell named *coltarg* the result of the formula:

+"D"&@STRING(@CELLPOINTER("row"),Ø)

This formula links the letter of the target column with the number of the current row. The second step of the routine sends the cell pointer to the cell whose address is now stored in *coltarg*.

ON YOUR OWN

We've looked at many of the mechanisms for using macros to navigate about the worksheet. However, this article isn't exhaustive. Experiment with the techniques we've explored. Combining these techniques with some of your own will give your macros pinpoint control over cell-pointer movements. ■



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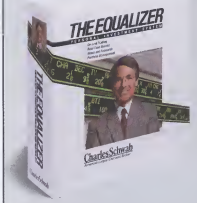

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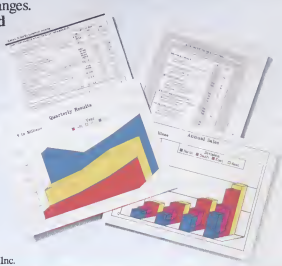

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ACCOUNTING

KEEP AFLOAT WITH A SINKING FUND

Use these models and compounded interest rates to cover an expense down the line.

BY STEPHEN L. NELSON

How can you raise the money to replace a piece of equipment five years from now or to pay the retirement benefits your employees are accruing? Set up a sinking fund. The dictionary defines a sinking fund as a fund established to pay off a debt when it falls due, but the term can be applied to any investment or annuity set up for the express purpose of accumulating a specified amount.

The two worksheets that follow will teach you how to construct and use sinking fund schedules. Both examples work with all releases of *1-2-3* and *Symphony*; the second requires a slight modification for *1-2-3* Release 1A. One worksheet is for compounding a lump sum into a future value. The other is for either an ordinary annuity or an annuity-due fund set up to mature to a given future value.

STARTING WITH A LUMP SUM

A good way to start a sinking fund is to make one lump payment that delivers a required future value at a specified time, given such variables as future value, interest rate, number of compounding periods, and marginal tax rate.

Suppose you're a commercial printer and you want to determine how much money you should set aside now to be able to purchase a $140,000 two-color press five years from now. Figure 1 shows a sinking fund schedule with all necessary financial details. Once you've set up the template, simply enter your requirements in range C6..C9. The values indicate that you need $140,000 in five years, that you can set up a fund at 9% annual interest, and that interest income is taxed at 33% per year. The formula in cell B11 indicates that your initial investment must be $104,468.23.

A schedule for the fund begins in row 14. This shows you, year by year, the interest your investment earns, the taxes on the interest income, and the balance of the fund. The formulas actually extend to row 36 of the worksheet, allowing for up to 20 periods. The formulas return a zero if the period number in column A is greater than the number of periods you entered in cell C7.

	A	B	C	D	E
1	SINKING FUND SCHEDULE				
2	LUMP SUM				
3					
4	Input Parameters				
5					
6	Desired FV		$140,000		
7	Periods to Reach FV		5		
8	Interest Rate		9.00%		
9	Marginal Tax Rate		33.00%		
10	---	---	---	---	
11	Initial Lump Sum	$104,468.23			
12					
13					
14	Period	Interest	Tax on	Sinking	
15	Number	Income	Income	Fund	
16	---	---	---	---	
17	1	$9,402.14	$3,102.71	$110,767.66	
18	2	9,969.09	3,289.80	117,446.95	
19	3	10,570.23	3,488.17	124,529.00	
20	4	11,207.61	3,698.51	132,038.10	
21	5	11,883.43	3,921.53	140,000.00	

FIGURE 1. This portion of a sinking fund worksheet gives you all the steps required to set up a lump-sum fund. Once you enter the parameters of your fund in range C6..C9, the formula in cell C11 tells you how much you must put into the fund. The schedule, starting in row 14, shows the status of the fund for each period.

To create this model, start with a new worksheet and set the default format to currency with two decimal places. In *1-2-3* press slash, select Worksheet Global Format Currency, and press Return to accept the default of two decimal places. (In *Symphony* press MENU, select Settings Format Currency, press Return to accept the default of two decimal places, and select Quit.) Set the width of column B to 12: Position the cell pointer in column B, select /Worksheet Column Set-Width (in *Symphony*, MENU Width Set), and enter *12*. In the same manner, set the widths of columns C and D to 12 and 13, respectively.

Enter all the labels shown in figure 1. Enter a backslash hyphen (\–) in cell A10, and copy cell A10 to

Stephen L. Nelson, CPA, is a consultant in Redmond, Wash., and author of Using DAC-Easy Accounting, *to be published by Que Corp.*

range B10..C10. Type a quotation mark and six hyphens ("------) in cell A16, and copy cell A16 to range B16..D16. Right-align the labels in rows 14 and 15: Select /Range Label Right (in *Symphony*, MENU Range Label-Alignment Right), and specify range A14..D15. Put the numbers 1 to 20 in range A17..A36: Select /Data Fill (in *Symphony*, MENU Range Fill), specify range A17..A36 as the Fill range, enter *1* as the start value, and press Return twice to accept the default step and stop values.

To assign formats and range names and enter formulas for figure 1, follow the steps in the Setup Table. To assign a format, press slash (in *Symphony*, MENU), select the format from the menu, and specify the cell or range shown in the box. To assign a range name, press slash (in *Symphony*, MENU), and select Range Name Create; then enter the range name and specify the cell, both of which are shown in the box. When you've entered the formulas, copy range B18..D18 to range B19..B36.

Save the worksheet so that you can use it for evaluating your own sinking fund. Enter the amount of money you'll need, the number of periods until you need it, the interest rate, and the tax rate in range C6..C9. Enter the percent sign along with the interest rates in cells C8 and C9. Normally, the value you enter in cell C7 will refer to years, but it could just as easily refer to quarters or months. If you need to accrue a certain amount in a year's time and you want the schedule to show the status of the fund on a monthly basis, enter the value 12 in cell C7. If you do this, remember to divide the annual interest and tax rates by 12.

ANNUITY FUNDING REQUIREMENTS

Instead of the lump-sum approach to creating a sinking fund, you can make a series of equal payments until you reach your goal. After you've determined the required future payout, interest rate, number of compounding periods, and marginal tax rate, you can calculate the amount you must invest per period to accumulate the future value.

Suppose you're the controller of a firm that has promised its employees specific benefits upon retirement. An outside consultant has estimated that you must accumulate $1 million in 20 years in order to meet your obligations. That sum will then be used to purchase retirement annuities for the retired employ-

SETUP TABLE

Format ranges as follows:

Format	Range
Currency, Ø	C6
Percent (%), 2	C8..C9
General	C7
General	A17..A36
, (Punctuated), 2	B18..D18

Assign range names as follows:

Name	Range
fut_value	C6
periods	C7
interest	C8
taxrate	C9

Enter the formulas for figure 1 as follows:

Cell	Formula
C11	+fut_value/(1+interest* (1−taxrate))^periods
B17	+C11*$interest
C17	+B17*$taxrate
D17	+C11+B17−C17
B18	+D17*$interest* (A18<=$periods)
C18	+B18*$taxrate
D18	(D17+B18−C18)* (A18<=$periods)

Enter the formulas for figure 2 as follows:

Cell	Formula
C12	@PMT((fut_value/(1+interest*(1−taxrate)) ^periods),interest*(1−taxrate),periods)/ @IF(switch="Y",1,(1+interest* (1−taxrate)))
B18	+$interest*$payment*(switch="Y")
C18	+B18*$taxrate
D18	+$payment+B18−C18
B19	@IF($switch="Y",D18*$interest, (D18+$payment)*$interest)* (A19<=$periods)
C19	+B19*$taxrate
D19	(D18+$payment+B19−C19)* (A19<=$periods)

In 1-2-3 Release 1A, enter formulas as follows:

Cell	Formula
C12	@PMT((fut_value/(1+interest*(1−taxrate)) ^periods),interest*(1−taxrate),periods)/ @IF(switch,1,(1+interest* (1−taxrate)))
B18	+$interest*$payment*(switch=1)
B19	@IF($switch,D18*$interest, (D18+$payment)*$interest)* (A19<=$periods)

Note: In *1-2-3*, to format values to display commas, select /Range Format, select the comma from the menu, and specify the desired range.

ees. The model in figure 2 calculates the amount you must put away each year to meet your goal.

The worksheet for annuity-based sinking funds uses the same input parameters as the lump-sum model. But you must choose between beginning-of-period and end-of-period payments. If payment is at the end, that constitutes an ordinary annuity, so enter "*Y* in cell C10. If payment is to be at the beginning of each period, indicating an annuity-due arrangement, enter "*N* in cell C10.

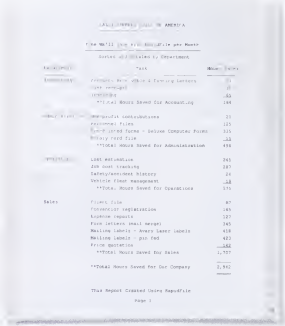
The values that are shown in the upper part of figure 2 indicate that your firm needs to acquire $1 million by the end of 20 years, that it invests money at 9% annual interest, that interest income is taxed at 34% per year, and that payment will be made on an ordinary-annuity basis. Given these parameters, the formula in cell C12 indicates that the firm must contribute $27,360.38 to the fund each year. The schedule beginning in row 15 shows the interest received, the tax on interest income, and the balance of the sinking fund for each year. Several spreadsheet rows are not shown. Note that the amount accumulated by the last period is slightly higher than the desired future value in cell C6. If you specify annuity due by entering "*N* in cell C10, the balance in the last period will be slightly lower than the desired amount. In either case, the difference will amount to about half a percent, depending on the interest rate.

	A	B	C	D	E
1	SINKING FUND SCHEDULE				
2	ANNUITIES				
3					
4	Input parameters				
5					
6	Desired FV		$1,000,000		
7	Periods to Reach FV		20		
8	Interest Rate		9.00%		
9	Marginal Tax Rate		34.00%		
10	Ordinary Annuity(Y/N)		Y		
11					
12	Payment Amount		$27,360.38		
13					
14					
15	Period	Interest	Tax on	Sinking	
16	Number	Income	Income	Fund	
17					
18	1	$2,462.43	$837.23	$28,985.58	
19	2	2,608.70	886.96	58,067.70	
20	3	5,226.09	1,776.87	88,877.30	
35	18	69,472.99	23,620.82	845,134.71	
36	19	76,062.12	25,861.12	922,696.09	
37	20	83,042.65	28,234.50	1,004,864.61	

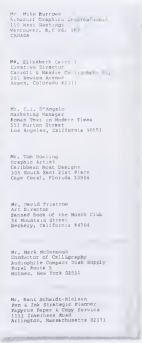
FIGURE 2. This adapted version of the worksheet shows you how to manage an annuity sinking fund. Enter the parameters of the fund in range C6..C10. Cell C12 returns your per-period payment. The schedule, starting in row 15, gives you the period-by-period status of the account.

To create the annuity model, start with the work-

Rapid lists.



Rapid labels.



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sheet you created in the last section. Replace the label in cell A2 with the label *Annuities*, and replace the label in cell A11 with the label *Payment Amount*. Erase range B17..D36 and cell C11. Add a row to the spreadsheet: Move the cell pointer to row 10, select /Worksheet Insert Row (in *Symphony*, MENU Insert Row), and press Return. Enter the label *Ordinary Annuity(Y/N)* in cell A10. Assign the name *switch* to cell C10 and the name *payment* to cell C12. (In *1-2-3* Release 1A, enter the label *'1 = Ord Ann/Ø = Ann Due* in cell A10.) Enter the values shown in range C6..C9, and enter the label *"Y* in cell C10. (In *1-2-3* Release 1A, enter *1* in cell C10 and assign the General format to that cell.)

Enter the formulas for figure 2 shown in the Setup Table, then copy range B19..D19 to range B20..B37. Save this worksheet using a name different from the one used for the lump-sum worksheet.

Take another look at the formula in cell C12. It returns the per-period payment required to produce the desired future amount. This is primarily an @PMT function, which takes the arguments *principle, interest*, and *periods*. Here, the arguments are adjusted to account for the effects of interest-income taxes. Normally, the @PMT function, like all the financial @functions, returns a value based on ordinary annuity. To adjust the result of an @PMT formula for annuity due, divide it by the sum of 1 and the interest rate. In cell C12 the @PMT expression is divided by an @IF expression that evaluates to 1 when the label in cell C10 is *Y*; otherwise, it evaluates to 1 plus the interest rate times the difference of 1 minus the tax rate.

GETTING THE RESULTS ON THE BOOKS

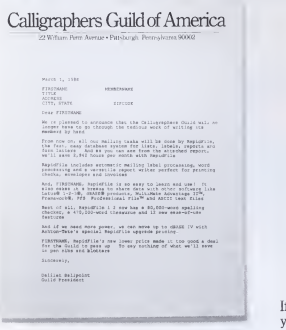
Accounting for sinking fund transactions based on these schedules is straightforward. To record payments to the sinking fund, debit your sinking fund account and credit your cash account. To record interest earnings, debit your sinking fund account and credit your interest income account by the amount shown in the *Interest Income* column of the worksheet. To record income tax expense, debit income tax expense and credit income tax payable by the amount in the *Tax on Income* column.

You can also use these schedules to test how sensitive your sinking fund forecasts are to changes in stated future values, interest rates, marginal tax rates, and number of compounding periods.

To add more periods to the model, enter additional period numbers starting in cell A38, and copy the formulas in range B37..D37 as far down as necessary.

Take steps to ensure the accuracy of the values you enter into these models. Over time, input errors can result in large variances from planned performance. ■

Rapid letters.


Calligraphers Guild of America
22 William Penn Avenue • Pittsburgh, Pennsylvania 90062

March 1, 1988

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TITLE
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Guild President

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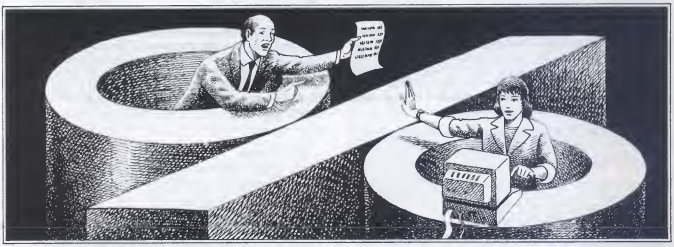
CIRCLE 120 ON READER SERVICE CARD

WHEN 10% ISN'T 10%

By converting a bank's quoted interest rate to an effective interest rate, this ready-to-run template makes financial @functions reflect the real world.

BY DONALD C. DIXON



JEAN-FRANCOIS ALLAUX

The financial @functions built into *1-2-3* and *Symphony* simplify the task of evaluating investments, savings plans, and loan opportunities. Understand, though, that the logic *1-2-3* and *Symphony* apply to these functions assumes that the compounding periods and payment periods are the same. Suppose, for example, that at the beginning of each year you put $2,000 into an IRA with interest compounded annually. The @FV function is fine for calculating the aggregate principal and interest over any number of years. If, however, you put $500 into an IRA each quarter and interest is compounded monthly, the @FV function will not accurately handle the calculation because the compounding and payment periods differ.

You can use *1-2-3* Release 2/2.01 or *Symphony* to create a spreadsheet that will let you examine the performance of loans, annuities, or sinking funds regardless of whether the compounding and payment periods coincide. Using this spreadsheet will sharpen your understanding of saving and borrowing and will help you ask pointed questions of your banker and broker. The six sections in the spreadsheet enable you to calculate the following elements of a loan or annuity: the future value of an annuity, the present value of an annuity, the per-period payment on a loan, the payment needed to reach a specified amount in a sinking fund, the term of an annuity, and the term of a loan.

The spreadsheet makes two conversions to accommodate different compounding and payment periods. First, it converts the nominal annual interest rate (the rate quoted by the lender or savings institution) to an effective annual rate that takes into account the effect of compounding interest more often than once a year. Second, it converts the effective rate to a rate-per-payment, or deposit, period. Once these conversions are made, additional formulas use the results to return the values pertinent to their respective sections in the spreadsheet. These formulas are based on standard financial @functions and use the converted interest rates as arguments. See the "Converting Interest Rates" box (page 51) for an explanation of how these conversions work.

Donald C. Dixon developed his financial techniques from independent research.

BUILDING THE WORKSHEET

Start with a new worksheet. Set the default format for currency with two decimal places and set calculation to manual: Press slash, select Worksheet Global Format Currency, and press Return to accept the default

	A	B
1	FUTURE VALUE OF AN ANNUITY	
2		
3	ASSUMPTIONS	
4	Payment	$500.00
5	Interest Rate (Enter % or Decimal)	7.60%
6	Compounding Periods Per Year	continuous
7	Days in Year (Continuous Compounding)	360
8	Payment Periods Per Year	4
9	Number of Years	25
10		
11	CALCULATIONS	
12	Annual Effective Interest Rate	8.01%
13	Interest Rate Per Payment Period	1.95%
14		
15	Total Number of Payments	100
16		
17		
18	Future Value (Ordinary Annuity)	$150,757.97
19	Future Value (Annuity Due)	$153,690.31

FIGURE 1. This portion of the worksheet calculates the future value of a given sum invested regularly at a specified interest rate. Cells B18 and B19 show what your money will be worth in 25 years if you deposit $500 per quarter into an account with a stated interest rate of 7.6% compounded continuously over a 360-day year. Cell B18 is based on ordinary annuity (payments made at the ends of periods), and cell B19 is based on annuity due (payments made at the beginnings of periods).

	A	B
41	LOAN PAYMENT	
42		
43	ASSUMPTIONS	
44	Principal	$75,000.00
45	Interest Rate (Enter % or Decimal)	10.00%
46	Compounding Periods Per Year	2
47	Days in Year (Continuous Compounding)	
48	Payment Periods Per Year	12
49	Number of Years	20
50		
51	CALCULATIONS	
52	Annual Effective Interest Rate	10.25%
53	Interest Rate Per Payment Period	0.82%
54		
55	Total Number of Payments	240
56		
57		
58	Payment (Ordinary Annuity)	$713.75
59	Payment (Annuity Due)	$707.97

FIGURE 2. This portion of the worksheet calculates what your per-period payments will be if you borrow money according to the terms detailed in range B44..B49.

of two decimal places. Then select /Worksheet Global Recalculation Manual. (In *Symphony* press MENU, select Settings Format Currency, and press Return to accept the default of two decimal places. Then select Recalculation Method Manual Quit.) Next, set the width of column A to 40 characters: With the cell pointer in column A, select /Worksheet Column Set-Width (in *Symphony*, MENU Width Set) and enter *40*. In the same manner, set the width of column B to 15.

Enter the labels shown in column A of figure 1, except for the label in cell A1. Don't enter anything in range B4..B9 yet. Enter the following formulas in the cells indicated (these formulas are explained in the box):

	A	B
81	TERM OF AN ANNUITY	
82		
83	ASSUMPTIONS	
84	Payment	$1,000.00
85	Future Value	$500,000.00
86	Interest rate (Enter % or decimal)	7.50%
87	Compounding Periods Per Year	12
88	Days In Year (Continuous Compounding)	
89	Payment Periods Per Year	2
90		
91	CALCULATIONS	
92	Annual Effective Interest Rate	7.76%
93	Interest Rate Per Payment Period	3.81%
94		
95	Term (Ordinary Annuity)	80.20
96	Term (Annuity Due)	79.25
97		
98	Years (Ordinary Annuity)	40.10
99	Years (Annuity Due)	39.62

FIGURE 3. This portion of the worksheet indicates how long it will take to accumulate a desired future value given the per-period payment, interest rate, compounding frequency, and payment frequency detailed in cell B84 and range B86..B89. The results in cells B95 and B96 represent payment periods, not years; here they represent half years, as indicated by the value 2 entered in cell B89. Formulas in cells B98 and B99 convert payment periods to years.

Cell	Formula
B12	@IF(@CELL("type",B6..B6)="v",(1+B5/B6)^B6−1,@EXP(B5/B7*365)−1)
B13	(1+B12)^(1/B8)−1
B15	+B8*B9

Note that many of the formulas in the worksheet will return ERR until you enter information.

Assign a percent format with two decimal places to cell B5 and range B12..B13: Select /Range Format Percent (in *Symphony*, MENU Format %), press Return to accept the default of two decimal places, and specify the appropriate cell or range. Then assign the General format to range B6..B9 and to cell B15.

The labels and formulas you've just entered will serve as a pattern for the remaining sections of the worksheet. To make four copies of the first section, copy range A1..B80 to cell A21. Enter the label shown in cell A1 of figure 1, and then enter the formula @FV(B4,B13,B15) in cell B18 and the formula (1+B13)*B18 in cell B19. These formulas initially return ERR. You've now completed the future-value section of the worksheet.

To complete the present-value section, enter the label *PRESENT VALUE OF AN ANNUITY* in cell A21, and edit the labels in cells A38 and A39 by changing the word *Future* to *Present*. Then enter the formula @PV(B24,B33,B35) in cell B38 and the formula (1+B33)*B38 in cell B39.

Now finish the loan-payment section of the worksheet, as shown in figure 2. Enter the label *LOAN PAYMENT* in cell A41, and enter the label *Principal* in cell A44. Edit cells A58 and A59, changing the label *Future Value* to *Payment*. Then enter the formula

CONVERTING INTEREST RATES

Compound interest is the interest earned on the principal plus interest added to the principal at a predetermined interval: once each year, twice a year, quarterly, and so on. How often interest is compounded has an effect on a fund's performance. When comparing two funds, you should determine the annual effective rate (AER) for both. The AER is the nominal interest rate adjusted to show the effect of compounding interest more often than once a year. Using the variables i for nominal interest rate and c for number of compounding periods, the following formula converts the nominal interest rate to the effective rate:

$$\text{AER} = (1 + i/c)^c - 1$$

As you might expect, the more frequent the compounding period, the more interest you earn and the higher the effective interest rate. Suppose you're evaluating two savings accounts, both having a nominal interest rate of 8%, one compounded quarterly and one compounded monthly. Apply these values to the above formula and you get:

$$(1 + .08/4)^4 - 1 = .0824$$

and

$$(1 + .08/12)^{12} - 1 = .083$$

That is, 8% has an effective rate of 8.24% compounded quarterly and 8.3% compounded monthly.

Many banks and savings institutions now use continuous compounding to attract investors. You must use a different formula to determine the effective rate generated by continuous compounding.

Because you've learned that compounding interest more often increases the effective interest rate, you might think that continuous compounding would quickly double, triple, or quadruple an investment in a dizzying geometric progression. Unfortunately, continuous compounding produces an annual effective rate only slightly higher than the nominal rate.

The mathematical process of continuous compounding is, nevertheless, intriguing. In experimenting with pushing compounding to its limits, mathematicians and financial experts discovered that if $1 is invested at 100% interest for 1 year and if the frequency of compounding periods increases indefinitely, the sum of the principal and interest eventually reaches a limiting value of $2.718282. This number is the natural number e that has long fascinated mathematicians. It forms the basis of laws of continuous growth that also apply to timber and bacteria.

To convert nominal rates to effective rates in a continuous-compounding setting, raise 2.718282 to the power of the interest rate and subtract 1. You must also allow for the fact that a bank may use a 360-day year when calculating interest. You allow for this by dividing the nominal rate by 360 and then multiplying that quotient by 365.

Call i the nominal interest rate, d the days per year used by the institution, and e the natural number 2.718282. Then determine the AER with this formula:

$$\text{AER} = e^{i/d \times 365} - 1$$

If a bank offers 10% interest and i uses a 360-day year, use this formula:

$$2.718282^{1/360 \times 365} - 1 = .106706$$

That is, the effective interest rate is 10.67%. To make this calculation with *1-2-3* or *Symphony*, use the @EXP function. Enter the formula @EXP (0.1/360*365) − 1 into an empty cell; the formula returns 0.106706 (10.67% if the cell is formatted for percent with two decimal places).

The interest-conversion spreadsheet uses both of these formulas as expressions in @IF formulas so that the models choose the appropriate method for determining AER. The formula in cell B12 reads:

```
@IF(@CELL("type",B6..B6)="v",
  (1+B5/B6)^B6-1,@EXP(B5/B7*365)-1)
```

The first argument tests to see if cell B6 contains a value. If this is the case, the formula returns the result of its middle expression, (1+B5/B6)^B6−1. If cell B6 is left blank or contains a label, the formula returns the result of its third argument, @EXP (B5/B7*365)−1). This formula is copied into five other cells to make the conversions for the other sections of the worksheet.

Once you convert the nominal interest rate to the effective rate, you must determine the interest rate per payment period (IPP) to allow for situations where the payment period is different from the compounding period. Call p the number of payment periods per year, and use the following formula:

$$\text{IPP} = (1 + \text{AER})^{1/p} - 1$$

For example, if you are making monthly payments to a college fund and the bank uses continuous compounding that results in an effective rate of 10.67%, you would use this equation:

$$(1 + .1067)^{1/12} - 1 = .0085$$

Thus, the interest rate per payment period is .85%. The worksheet uses this formula in cell B13:

```
(1+B12)^(1/B8)-1
```

Again, this formula is copied into the corresponding cells of the other sections.

@PMT(B44,B53,B55) in cell B58 and the formula +B58/(1+B53) in cell B59.

To complete the sinking-fund section, enter the label *SINKING FUND: PERIODIC PAYMENT NEEDED TO REACH GOAL* in cell A61, enter the label *Future Value* in cell A64, and copy range A58..A59 to cell A78. Then enter the formula +B64/(((1+B73)^B75−1)/B73) in cell B78 and the formula +B78/(1+B73) in cell B79.

The last two sections of the worksheet deal with terms—that is, number of payments. The layout of these sections is slightly different from that of the other four sections, so you'll need to use the Move command to manipulate the labels and formulas. First, enter the label shown in cell A81 of figure 3. Then press slash (in *Symphony*, MENU), select Move, and specify A85..B88 as the From range and cell A86 as the To range. (You move empty cells to change cell references in the formulas in cells B92 and B93.) Enter the labels shown in range A95..A99 of figure 3. Enter the formula +B95/B89 in cell B98, and the formula +B96/B89 in cell B99.

Assign the Fixed format with two decimal places to range B95..B99, and before finishing this section, copy range A83..B100 to cell A103. Enter the label *Future Value* in cell A85, then enter the formula @TERM(B84,B93,B85) in cell B95 and the formula @TERM(B84,B93,B85/(1+B93)) in cell B96.

To complete the final section, enter the value *TERM OF A LOAN* in cell A101 and the label *Principal* in cell A105. Enter the following formula in cell B115:

−@LN(1−B105*B113/B104)/@LN(1+B113)

Finally, enter the following formula in cell B116 and then save the worksheet:

−@LN(1−B105*B113/(B104*(1+B113)))
/@LN(1+B113)

USING THE MODEL

Your interest-conversion worksheet is actually six independent models in one spreadsheet. You can easily find the section you want by using the PageUp and PageDown keys (assuming your monitor displays 20 spreadsheet rows). To use any section, simply enter into the fourth through ninth rows of column B the values that apply to a loan or investment and press the CALC key. The formulas in the 18th and 19th rows display the unknown values for the transaction you're evaluating.

Make special note of the *Compounding Periods Per Year* cell in each section. When interest is compounded quarterly, you enter *4* in this cell. For daily compounding, enter *365*; for monthly compounding, enter *12*; and so forth. When you enter a number in this cell, you may leave the *Days in Year* cell below it empty. When interest is compounded continuously, enter *continuous*. The formula that computes the effective rate is an @IF formula that returns the result of one of two expressions, depending on the entry in the compounding-periods cell (see the box). Specifically, the formula uses the continuous-compounding method if the compounding-periods cell contains anything but a value, so you can abbreviate *continuous* or even leave the cell blank if you want to see results based on continuous compounding. It's better, though, to enter *continuous* or its abbreviation if you want continuous compounding, so that the assumptions underlying the results are clear.

Be sure to use only whole numbers in the *Number of Years* cells. The results may be inaccurate if you use fractional numbers.

Let's try out the worksheet with a series of sample scenarios. The first section tells you the future value of an annuity. Assume that you want to invest $500 four times a year for 25 years in an IRA account paying 7.6% interest compounded continuously over a 360-day year. Enter the values and label shown in range B4..B9 of figure 1. You can enter the value in cell B5 either as .076 or 7.6%. Press the CALC key. The value in cell B18 indicates that in 25 years the fund will be worth more than $150,000 with an ordinary-annuity arrangement, in which payments are made at the ends of periods, or more than $153,000 with an annuity-due arrangement, in which payments are made at the beginnings of periods.

Press PageDown to move to the second section, to determine present values of annuities. Suppose you want to evaluate an investment that will pay you $500 semiannually for 10 years. The highest interest rate you can obtain from an interest-bearing account is 9% compounded quarterly. Enter the following values into the cells indicated:

Cell	Value
B24	500
B25	9%
B26	4
B28	2
B29	10

Press the CALC key. The values displayed in cells B38 and B39 indicate that the maximum you should offer for the investment is $6,475.53 or $6,770.21, depending on whether you receive payment at the end or the beginning of each period.

The third section calculates the per-period payment on a loan. Note that this section is especially useful for Canadian mortgages, which are usually compounded semiannually even though payments are monthly. Enter the values shown in range B44..B49 of figure 2 and press CALC. Cells B58 and B59 show you the monthly payment for ordinary-annuity and annuity-due loans.

Rows 61 through 79 contain the sinking-fund portion of the worksheet. This section answers the ques-

tion, "How much do I need to set aside to save a given amount of money in a given number of years?" (For more on sinking funds, see this month's Accounting column.) Let's say you want to accumulate $500,000 over a period of 30 years by making quarterly deposits with 8% interest compounded continuously. The bank uses a 360-day year. Make these entries:

Cell	Entry
B64	500000
B65	8%
B66	continuous
B67	360
B68	4
B69	30

Press CALC. Cells B78 and B79 indicate that your quarterly contribution to the fund must be $985.15 for an ordinary annuity or $965.37 for an annuity due.

The next section, beginning in row 81, calculates how many payment periods at a given payment amount are required to reach a specified future value. Suppose you want to accumulate $500,000 by making semiannual deposits of $1,000 with 7.5% interest compounded monthly. Enter the values shown in range B84..B89 of figure 3 and press CALC. Cells B95 and B96 indicate that reaching the goal requires a term of 80.2 or 79.25 payment periods, not years. In this case, payment periods are half years. Cells B98 and B99 convert the terms to years by dividing the term by the *Payment Periods Per Year* cell (B89).

The final section begins in row 101. It calculates how long it will take to pay off a loan. Suppose you want to borrow $30,000 and you can afford payments of $1,000 per quarter. Your bank will lend money at 10% interest compounded monthly. Make these entries:

Cell	Entry
B104	1000
B105	30000
B106	10%
B107	12
B108	4

Press the CALC key. The formulas in cells B115 and B116 indicate that it will take 56.70 or 55.31 quarters to repay the loan. The formulas in cells B118 and B119 translate these two values to 14.18 and 13.83 years.

Use this worksheet whenever you have a choice between two or more sets of terms for a loan or annuity. Find out how often the bank compounds interest or, if it uses continuous compounding, how many days per year it uses. Then enter the sets of terms, one after another, into the appropriate sections of the worksheet. This way, you can pick the terms that are most advantageous to you. ■

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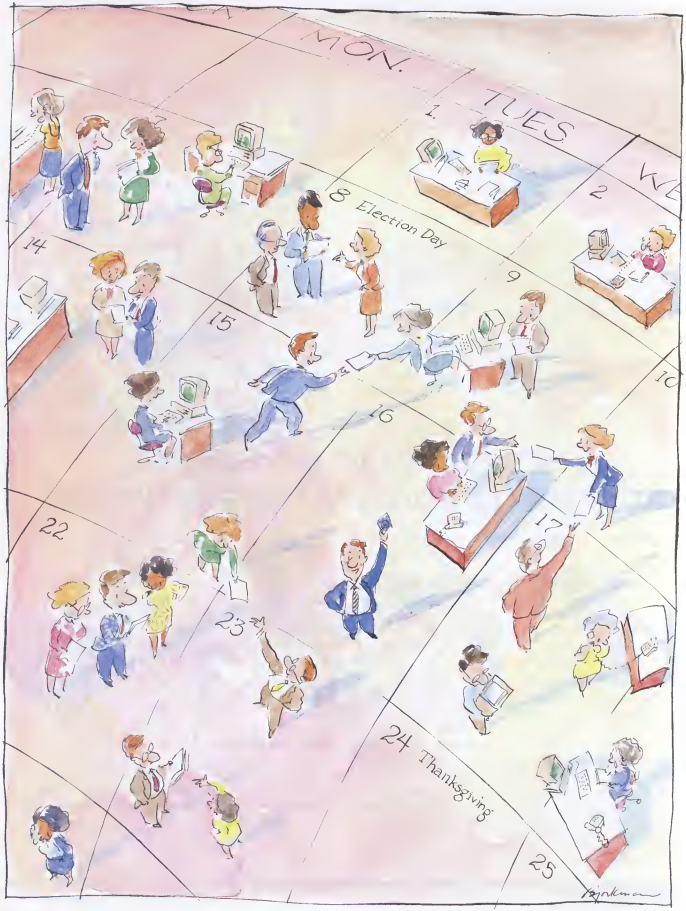
CIRCLE 121 ON READER SERVICE CARD



STEVE BJÖRKMAN

4 JOB SCHEDULES

BY EVERETTE S. GARDNER JR.

Your company may be one that works on only one job at a time and that must occasionally reschedule a backlog of jobs as new ones come in. Many businesses, from contractors to consultants, can shuffle jobs in an endless variety of sequences. However, devising a schedule to ensure that jobs get done on time often becomes a matter of trial and error. And trial and error not only produces bad schedules but wastes time that is better spent getting the actual work done.

This priority-scheduling model works in all releases of *1-2-3* and *Symphony*, except *1-2-3* Release 1A, and simplifies juggling a backlog and new work. Using the macros that accompany the model, you develop four work schedules, each meeting a different goal. One schedule sorts jobs in ascending sequence by order date to create a first-come, first-served (FCFS) schedule. Unless you get really lucky, FCFS almost always provides the worst arrangement of jobs, since the timing of customers' orders has no relation to due dates. Therefore, use FCFS as a benchmark for the other three schedules. Another schedule minimizes average flow time, where flow time is waiting time plus processing time for each job. Using this strategy makes sense when you have cash flow problems and want to get customer billings out the door quickly. But when your main concern is to meet due dates, choose between two other schedules: one that minimizes the number of days that a job will be late and another that minimizes the number of late jobs.

Understand that for most scheduling problems, you can't generate a schedule that meets all four goals at once. For example, a schedule that minimizes flow time often results in many jobs being late. Therefore, compare the schedules, one for each goal, before committing to one.

THE BIG PICTURE

Here's how the priority-scheduling model, shown in figure 1, operates. Starting in row 13, you enter basic data into the job list: job name; order date, which is the date the customer placed the order; due date originally promised; and estimated number of workdays. Then enter a kickoff date for the schedule in cell C5. This cell automatically generates the column of dates

Choose the one that matches your priority.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	SCHEDULING MACROS:													MOD	DAY
2	A - Order date (FCFS)			C - Min. days late										0	Sat
3	B - Min. avg. flow time			D - Min. nbr. late jobs										1	Sun
4														2	Mon
5	KICKOFF DATE:		01-Feb	CURRENT MACRO:		D - Min. nbr. late jobs								3	Tue
6	NBR. WORK DAYS:		13	AVG. FLOW TIME:		8.0								4	Wed
7	NBR. OFF DAYS:		5	MAX. DAYS LATE:		8								5	Thu
8	TOTAL DAYS:		18	NBR. LATE JOBS:		1								6	Fri
9	SCHEDULE ENDS:		18-Feb												
10															
11	JOB		ORDER	DATE	WORK	MOVE	START	STOP	START	STOP	FLOW	DAYS LATE	JOB	LONGEST JOB	
12	NAME		DATE	DUE	DAYS	MARKER	DAY #	DAY #	DATE	DATE	TIME	LATE	INDICATOR	JOB	NAME
13	Randalls		28-Jan	02-Feb	1		1	1	01-Feb	01-Feb	1	-1	0	1	Randalls
14	Bookstop		25-Jan	03-Feb	2		2	3	02-Feb	03-Feb	3	0	0	2	Bookstop
15	Pappasito		10-Jan	08-Feb	2		4	5	04-Feb	05-Feb	5	-3	0	2	Pappasito
16	Vasos BBQ		01-Feb	11-Feb	3		6	8	08-Feb	10-Feb	10	-1	0	3	Vasos BBQ
17	Norton Ditto		27-Jan	11-Feb	1		9	9	11-Feb	11-Feb	11	0	0	3	Norton Ditto
18	Astros		25-Jan	10-Feb	4	1	10	13	12-Feb	18-Feb	18	8	1	4	Astros
19															
20					**Job List**										
21	OFF-DAY								Length		4				
22	INDICATOR	OAY #	DATE	DAY	JOB WAME										
23		1	01-Feb	Mon	Randalls										
24		2	02-Feb	Tue	Bookstop										
25		3	03-Feb	Wed	Bookstop										
26		4	04-Feb	Thu	Pappasito										
27		5	05-Feb	Fri	Pappasito										
28	1	5	06-Feb	Sat											
29	1	5	07-Feb	Sun											
30		6	08-Feb	Mon	Vasos BBQ										
31		7	09-Feb	Tue	Vasos BBQ										
32		8	10-Feb	Wed	Vasos BBQ										
33		9	11-Feb	Thu	Norton Ditto										
34		10	12-Feb	Fri	Astros										
35	1	10	13-Feb	Sat											
36	1	10	14-Feb	Sun											
37		11	15-Feb	Mon	Astros										
38		12	16-Feb	Tue	Astros										
39	1	12	17-Feb	Wed											
40		13	18-Feb	Thu	Astros										
41		14	19-Feb	Fri											
42					**Scheduling Calendar**										

```
\a {LET current, A - Order date (FCFS)}
   /DSDschedule"Porder"A"G

\b {LET current, B - Min. avg. flowtime}
   /DSDschedule"Pdays"A"G

\c {LET current, C - Min. days late}
   /DSDschedule"Pdue"A"G

\d {LET current, D - Min. nbr. late jobs}
   {BLANK marker}
sort /DSDschedule"Pmarker"A"Sdue"A"G
   {IF nbrlate<2}{HOME}{QUIT}
   {GOTO}days:
search {IF @CELLPOINTER("contents")=$length}{BRANCH test}
   {DOWN}{BRANCH search}
 test {RIGHT}
   {IF @CELLPOINTER("contents")=1}{HOME}{QUIT}
   1~
   {BRANCH sort}
```

FIGURE 1. This is the priority-scheduling model. Using it you can juggle a backlog of work as new work comes in. Just enter the new jobs into the job list, extend the scheduling calendar, and select a macro to generate a schedule that meets one of four goals: first-come, first-served; minimum average flow time; minimum number of days late; or minimum number of late jobs.

that appears in range C23..C41 of the scheduling calendar. The *Off-Day Indicator* column of the scheduling calendar contains 1 opposite any date on which you don't plan to work. The model won't schedule a job for any date opposite a 1 in this column. In this example, weekends and Wednesday, February 17, are off days.

To develop a schedule, invoke one of the scheduling macros—*\a, \b, \c,* or *\d*—listed at the top of the worksheet.

Formulas in range I13..J18 calculate the start and stop dates for each job. The *Job Name* column of the scheduling calendar contains formulas that display the job scheduled, if any, for each date in the calendar. Range D5..F8 displays the results of the schedule. Cell F5 shows which macro was used to generate the current schedule. The three cells below show average flow time, maximum number of days late, and number of late jobs.

Given the job list shown in figure 1, here's a table of the schedule statistics produced by each macro:

	\a Order date FCFS	\b Minimum average flow time	\c Minimum days late	\d Number of late jobs
Minimum average flow time	9.5	7.3	8.3	8.0
Minimum days late	10	8	7	8
Number of late jobs	3	2	3	1

To compare the schedules, consider the statistics that each schedule produced for the other two goals. For example, the macro *\c* generates a schedule that minimizes the number of days a job will be late. To see this, look across the row labeled *Minimum days late* and compare the results of the other schedules. However, looking down the column labeled *Minimum days late*, you see that if you use this schedule, three jobs will be late and flow time will be 8.3 days. Consider all of that information before you commit to a particular schedule.

The macro *\d*, which generates a schedule that minimizes the number of late jobs, may be the best compromise. This schedule results in only 1 late job,

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which is 8 days late. Using macro \c, you cut the maximum number of days late to 7 but have 3 late jobs. Macro \b generates a schedule with a minimum flow time that is only 0.7 days less than the flow time in the macro \d schedule. The schedule generated by macro \a is the worst option.

Note that if you run the same macro two or more times in a row, some of the statistics may vary slightly. However, the number representing the goal, such as the minimum number of late jobs for macro \d, will never vary. For the data in this model, you'll always get only one late job in the schedule generated by \d.

Now that you have an overview of how the model works, let's build it step by step.

STEP 1: Enter labels

Because it is easy to confuse label cells with formula cells in this worksheet, first enter all of the labels shown in the following ranges of the figure: A1..A3, D2..D3, A5..A9, D5..D8, A11..A12, C11..O12, and A21..E22. Right-align the labels in range C11..N12. Press slash and select /Range Label Right (in *Symphony* press MENU and select Range Label-Alignment Right) and specify the range. Center the labels in range A21..E22. Select /Range Label Center (in *Symphony*, MENU Range Label-Alignment Center) and specify the range.

STEP 2: Enter job data

Starting in cell A13, enter the job names. Select /Range Format Date 2 (in *Symphony*, MENU Format Date 2). Specify range C13..D18. Use the @DATE (*year,month,day*) function to enter the order dates and due dates for each job. For example, enter the order date in cell C13 as @DATE(88,1,28).

STEP 3: Set up the scheduling calendar

To specify the schedule's kickoff date, enter *@DATE (88,2,1)* in cell C5 and then assign the Date 2 format to the cell. Enter the formula +C5 in cell C23 and the formula +C23+1 in cell C24. Copy cell C24 to range C25..C41. Assign the Date 2 format to range C23..C41.

To convert dates to days of the week, enter the table of numbers and days shown in range N2..O8. First enter the labels in range N1..O1. Right-align the label in cell N1. Center the label in cell O1. Then enter the numbers in range N2..N8. Next enter the abbreviation for each day in range O2..O8 with three leading spaces—that is, press the Spacebar three times before entering the abbreviation. You'll learn the reason for doing this in a moment.

Enter the following formula in cell D23:

@VLOOKUP(@MOD(C23,7),N2..O8,1)

Copy cell D23 to range D24..D41. The @MOD function returns a number from Ø to 6, indicating the day of the week. The @VLOOKUP function locates the number in the first column of the table N2..O8. Moving one column to the right, the formula returns the abbreviation for the day of the week. Because the @VLOOKUP function ignores cell prefixes, by entering leading spaces before each label, you force the function to return a centered label.

Enter *1*, which denotes an off day, in cells A28, A29, A35, A36, and A39. Range B23..B41 displays workday numbers that other @VLOOKUP formulas use to determine when to start and stop jobs. In cell B23 enter the following formula:

@IF(A23=1,Ø,1)

This formula says, if A23 is an off day, enter Ø in cell B23; otherwise, enter *1*.

In cell B24 enter the following formula:

@IF(A24=1,B23,B23+1)

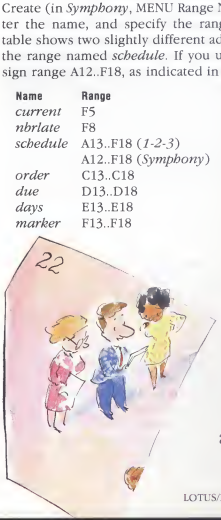
This formula says, if cell A24 is an off day, then repeat the number in cell B23; otherwise, increase the workday number by 1.

To complete the scheduling calendar, copy cell B24 to range B25..B41.

STEP 4: Assign range names

The macros and some formulas use named ranges. To assign the following range names, select /Range Name Create (in *Symphony*, MENU Range Name Create), enter the name, and specify the range. Note that the table shows two slightly different addresses listed for the range named *schedule*. If you use *Symphony*, assign range A12..F18, as indicated in the table.

Name	Range
current	F5
nbrlate	F8
schedule	A13..F18 (*1-2-3*)
	A12..F18 (*Symphony*)
order	C13..C18
due	D13..D18
days	E13..E18
marker	F13..F18



A first come, first served schedule is almost always the worst.

STEP 5: Enter estimated number of workdays and compute start-day and stop-day numbers

This step computes working-day numbers for each job. First enter the estimated number of workdays for each job as shown in range E13..E18 of figure 1. Then enter the following data and formulas in the cells indicated:

Cell	Entry
G13	1
H13	+G13+E13−1
G14	+H13+1

Copy cell H13 to cell H14. Copy range G14..H14 to range G15..G18.

STEP 6: Convert day numbers to dates

To convert start-day and stop-day numbers to calendar dates, enter the following formula in cell I13:

@VLOOKUP(G13,B23..C41,1)

Copy cell I13 to range I13..J18. This formula locates the day number in the first column of range B23..C41 and then moves one column to the right to return the date for that number. Assign the Date 2 format to range I13..J18.

STEP 7: Compute job flow time and lateness

Compute job flow time by entering the formula +J13−C5+1 in cell K13. This formula subtracts the kickoff date from the stop date and then adds 1 to compute the number of days from the kickoff date until the job is finished. Copy cell K13 to range K14..K18. In cell L13 compute the number of days a job is late by entering the formula +J13−D13. This is the stop date minus the due date. Notice that the *Days Late* column returns a negative number when the job is finished early and counts weekend days and off days in its calculation. Copy cell L13 to range L14..L18. Cells in column M display indicators that denote late jobs. In cell M13 enter the formula @IF(L13>Ø,1,Ø). If a job is late, the cell displays 1; otherwise, Ø. Copy cell M13 to range M14..M18.

STEP 8: Compute performance statistics

To compute the total number of workdays in your schedule, enter the formula @SUM(days) in cell C6 and the formula @SUM(A23..A41) in cell C7. In cell C8 enter the formula +C6+C7. To compute the date on which the schedule ends, enter the formula +J18 in cell C9, and assign the Date 2 format to the cell. Enter the formula @AVG(K13..K18) in cell F6 to compute average flow time, then format the cell for Fixed with one decimal place. Enter the formula @MAX (L13..L18) in cell F7 to calculate the maximum number of days that a job is late. Finally, to determine the number of late jobs, enter the formula @SUM (M13..M18) in cell F8.

STEP 9: Complete the calendar

To display the jobs in progress each day, use the working-day numbers to look up the job names. Ignore column N for the moment. Enter the formula +A13 in cell O13 and copy this cell to range O14..O18. Column O now repeats the job names in column A so that when you look at that half of the screen, you still see the job names. In cell E23 enter the following formula:

@IF(A23=1#OR#C23>J18,"",@VLOOKUP
(B23,G13..O18,8))

This formula tests for two conditions: Is the day an off day (A23=1) or is the date (C23) greater than the last working day in the schedule (J18)? If either condition is true, no job is in progress on that date, and the cell remains blank. If both conditions are false, the @VLOOKUP formula returns the job name. Copy cell E23 to range E24..E41.

STEP 10: Enter formulas needed in the macros

In cell N13 enter the formula @MAX(E13..E13) and copy that cell to range N14..N18. These @MAX formulas evaluate the values in the *Workdays* column. For example, the formula in cell N13 evaluates range E13..E13, cell N14 evaluates range E13..E14, and so on to return the longest job in the range. In cell J21 enter the formula @VLOOKUP(1,M13..N18,1). This formula is used by the macro to determine the barrier job, which is the longest job scheduled prior to the first late job. Enter the label *Length* in cell I21.

STEP 11: Enter and name macros

Carefully enter the macro names and code shown in range I24..J43 of figure 1. (If you use *Symphony*, enter the code shown in figure 2.) Precede the contents of each cell that begins with a slash, backslash, or value with an apostrophe label prefix, and be sure to enter all the tildes (~). Finally, select /Range Name Labels Right (in *Symphony*, MENU Range Name Labels Right) and indicate range I21..I40.

RUNNING THE A, B, AND C MACROS

Now try the macros. Hold down the MACRO key (Alt on most computers) and press A. The first line in macro \a, cell J24, is displayed in cell F5, which has the range name *current*, a reminder of which scheduling macro you are using. The second line, cell J25, sorts the range named *schedule*, which includes the columns *Job Name, Order Date, Date Due, Workdays*, and *Move Marker*. The macro doesn't sort the data in columns G through O, since formulas in those columns work no matter what order the jobs are in.

Macro \a sorts the jobs in ascending sequence according to order date. Try macro \b, which minimizes flow time by sorting the jobs in ascending order according to workdays. Finally, test macro \c. To mini-

```
    I        J        K        L        M        N        O
24  \a       {LET current, A - Order date (FCFS)}
25           {MENU}QSBDschedule~QS1order~A~QRAQ
26
27  \b       {LET current, B - Min. avg. flowtime}
28           {MENU}QSBDschedule~QS1days~A~QRAQ
29
30  \c       {LET current, C - Min. days late}
31           {MENU}QSBDschedule~QS1due~A~QRAQ
32
33  \d       {LET current, D - Min. nbr. late jobs}
34           {BLANK marker}
35  sort     {MENU}QSBDschedule~QS1marker~A~S2due~A~QRAQ
36           {IF nbrlate<2}{HOME}{QUIT}
37           {GOTO}days~
38  search   {IF @CELLPOINTER("contents")=$length}{BRANCH test}
39           {DOWN}{BRANCH search}
40  test     {RIGHT}
41           {IF @CELLPOINTER("contents")=1}{HOME}{QUIT}
42           1~
43           {BRANCH sort}
```

FIGURE 2. ***Symphony*** **macro code**

mize the number of late days for any job, this macro sorts jobs in ascending order according to due date. As you test each macro, compare your results to the table presented earlier in the article. If you fail to obtain the same numbers, you've made a mistake building the model.

RUNNING THE D MACRO

Macro *\d* is complicated. It identifies and reschedules "barrier" jobs, which occur early in the schedule and prevent later jobs from being done on time. The macro moves barrier jobs to the end of the schedule and frees up time that can be used for completing other jobs.

Consider the step-by-step logic that the macro uses to determine the schedule. Starting in cell J34 the {BLANK} command erases the *Move Marker* column. The subroutine named *sort*, in cell J35, uses the range named *marker* as the primary key and the range named *due* as the secondary key to sort the schedule. When the macro begins to process, the *Move Marker* column is blank. Therefore, the schedule first sorts according to due date.

In cell J36 the {IF} statement determines whether the cell named *nbrlate*, which contains the number of late jobs, is less than 2. If so, the schedule is optimal, since if there is only one late job, you won't gain anything by moving that job to the end of the schedule. The job is already late, so why make it later? Then the macro moves to the Home position and quits.

If the number of late jobs is equal to or greater than 2, the cell pointer moves to the top of the range named *days*. Then the subroutine *search*, which starts in cell J38, begins with an {IF} statement that determines whether the contents of the current cell are equal to the length of the longest job.

When the {IF} statement is true, the macro branches to the subroutine *test*. When {IF} is false, the macro moves the pointer down one cell in the range named *days* and repeats the *search* subroutine.

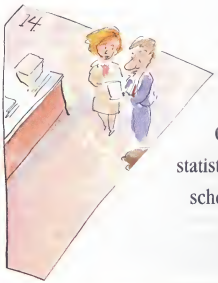
The subroutine *test* moves the pointer right once into the *Move Marker* column, which the macro uses to identify and rearrange barrier jobs. If the current cell contains 1, the barrier job has already been moved and the macro quits. If the current cell does not contain 1, the macro enters a 1 and re-sorts the jobs. In the second and subsequent sorts, all barrier jobs are moved automatically to the bottom of the stack. This occurs because the range named *marker* contains empty cells for nonbarrier jobs. Empty cells always appear first in the sort order, while cells containing 1 appear at the bottom.

MODIFYING THE SCHEDULING WORKSHEET

Modifying the worksheet is easy. To make room to include more jobs on the worksheet, position the pointer anywhere in row 15 and select /Worksheet Insert Row (in *Symphony*, MENU Insert Row). Press the DownArrow key to insert as many rows as you need, and then press Return. Enter the job names; order dates, due dates, and estimated number of workdays for each new job. Then copy the formulas in range G14..O14 to the newly inserted rows. All ranges used in the formulas automatically adjust to accommodate the new rows.

To extend the scheduling calendar, copy the last row of the scheduling calendar to as many new rows as you need. It doesn't matter if the calendar extends far beyond the last scheduled job. In cell I13 edit the @VLOOKUP formula to include the new rows, and copy that cell to the rest of the range that contains dates in columns I and J. Don't forget to enter off-day indicators. In cell C7 edit the formula to count the off-day indicators in the expanded scheduling calendar.

The scheduling macros in this article are real time-savers. In addition, they produce solutions guaranteed to be optimal for each of their goals. ■



Compare the statistics for each schedule before committing to one.

AGENDA
'It Works the Way I Think'

Early users of *Lotus Agenda* are finding new ways to organize the flow of information across their desks.

BY JEFFREY N. BAIRSTOW

Businesspeople, like homemakers, spend a lot of time trying to create order out of chaos. For businesspeople, at least, a new category of software, dubbed personal information management (PIM) software, may offer some help.

The most prominent and ambitious PIM program to date is Lotus Development Corp.'s *Lotus Agenda* ($395), released in July (see New Products in the October issue). Even before *Agenda* was released, scores of managers across the United States and Canada had used an early test version to develop business applications.

Some of those applications are as simple as organizing those little yellow notes that seem to breed like rabbits as the day progresses. Others are more complex, involving textual analysis and the handling of electronic mail:

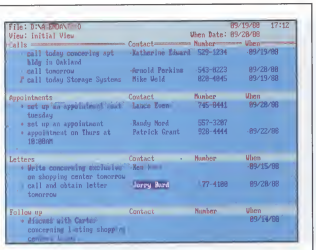
• John Speer, of Dome Petroleum in Calgary, Alberta, uses *Agenda* to analyze legislative drafts that may run to 30 pages in length. The aim is to pull out all data related to royalties or prior exploration in oil fields where Dome has an interest. Speer, who is manager of corporate economics for Dome's Frontier Division, says the drafts "compare in complexity to the 1986 U.S. Tax Reform Act."

• Dale Lewallen, a financial officer with First Interstate Bancorp in Los Angeles, uses *Agenda* to archive messages—and his replies—from the three electronic-mail systems he calls up every day. Says Lewallen: "I can slice and dice the text any way I want." Richard Silverston, a senior systems consultant with the Corporate Division of Atlantic Richfield Co. (ARCO) in L.A., also uses *Agenda* to manage his electronic mail. "It's a very neat way," he says, "of keeping mail organized and accessible."

Early *Agenda* users also use the program to manage projects and schedules. And some of those applications have little to do with business. Sam Moeller, a PC business specialist with a New York City commodities trading firm, relied on *Agenda* to plan his family's move from Manhattan to the suburbs.

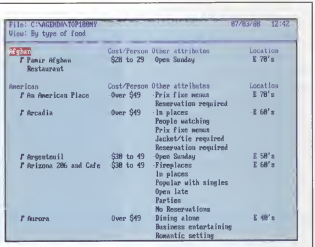
Commercial software based on *Agenda* applications is currently on the market, with more under development:

• Robert Tabke, software consultant with Tabke Dawson Associates in Palo Alto, Calif., has developed an *Agenda* template for attorneys. The template includes a starting database lawyers can use to set up a corporate annual meeting, perform a merger, or prepare an initial public offering of stock. The template,



THE ULTIMATE TO-DO LIST

Real estate broker Philip Johnson can order up a task list organized by date, priority, or customer.



A FLEXIBLE DIRECTORY

The *Top100 Guides* let you search in different ways. They also let you add, drop, and change entries.

which allows attorneys to track multiple projects and clients, is expected to be available for $95 this fall.

• Dick Bard, an *Agenda* consultant and president of Easy Software in New York City, is marketing *Three 'n Easy*, a $70 set of menu-driven applications that, he says, "put an *Agenda* shell around *Agenda*" to help users manage ideas and schedules. At press time, he was also putting the finishing touches on a $200 program called *The Builder's Organizer*. Bard, himself a former contractor, says it "handles all the information a builder needs about a job."

• Husband-and-wife team Robert and Lauren Flast are marketing more than 20 *Agenda* databases, including a series known as *Top100 Guides*. To date, you can buy versions of the restaurant databases for New York, Boston, San Francisco, and five other cities at $30 apiece. Each guide contains a database of the top 100 restaurants in that city. You can, for example, search the New York database for an Italian restaurant that is located on that city's Upper West Side, welcomes children, and has entrees priced at under $20. But more important, you can add your own comments, add or delete categories and restaurants, and so create a highly personalized guide.

All these applications differ widely, but a common thread runs through conversations with early *Agenda* users: The program is readily adaptable to individual styles and needs. That is largely because, unlike other database programs, *Agenda* does not require you to structure your data before you enter it.

"The lack of [initial] structure and the fact that structure can be imposed or changed later when data have been collected is a great feature," says Bancorp's Lewallen. "Not only does *Agenda* work the way I think," says Dome's Speer, "but it thinks the way I work."

HOW AGENDA WORKS

Not surprisingly, most people have trouble defining the program in a few words. Lotus Development Corp.'s own definition: *Agenda* is a flexible tool for managing ideas, tasks, people, projects, plans, and goals. It is certainly all those things and perhaps has the potential to be more, as users create applications that go beyond mundane to-do lists and project tracking.

Agenda's basic building blocks are items, notes, categories, and views. An item is a single piece of text that can be up to 350 characters long. It might be a simple word or two, such as *Saturday's picnic*, or a headline, such as *Emerson Electric Profits Up in Third Quarter*, or a reminder, such as *Make sure that Fred has cash flow projections to prepare slides for meeting next Wednesday*. You can type items into *Agenda* in any order, without any a priori, imposed file structure. You can add structure later when you need it.

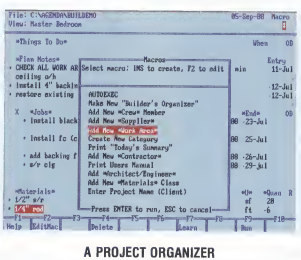
If you can't cram everything you wish into an item, you can attach a note to it. A note can be as long as 10K, which is roughly equivalent to seven pages of double-spaced typed text. You can type a note directly into *Agenda*, just like an item. But a note can also be an ASCII file you import from another program—say, a word-processor file or a spreadsheet print file. In addition, a note can be an external text file, called a note file, that is linked to *Agenda* and that you can view and modify. The advantage of such a file is that it can be continuously updated by someone who is not

privy to your *Agenda* database.

When you are ready to organize an *Agenda* database, you make a list of categories. You can assign the items to them at that time or later on. And you can assign the same item to several categories.

One of *Agenda*'s most powerful features, though, is its ability to assign items automatically as it recognizes key words. A key word might be a person's name, a date, an activity, or anything else you specify. If you use such key words and you change the content of an item, *Agenda* reacts accordingly. For example, if Susan replaces Bill as purchasing manager, *Agenda* might automatically reassign the items relating to purchasing manager from the "Bill" category to the "Susan" category. Any notes attached to or referenced by those items remain so.

To impose order on the screen output of an *Agenda* database, you use a view. An *Agenda* view is the equivalent of a report for a conventional database. Suppose, for example, you have assigned high, medium, and low priorities to the items in a to-do list. You can create a view that looks at all items with a high priority. Or you can define a view of all high-priority items that must be completed by the end of the week. You can also add or modify items in a view and thereby change the database itself.



A PROJECT ORGANIZER

Software developer Dick Bard relied on complex macros to make *The Builder's Organizer* easy to use.

AN EASY START: THE TO-DO LIST

Most first-time *Agenda* users start with a to-do list. That was true for Philip Johnson, a real estate broker with Pacific Union Commercial Brokerage Co. in San Francisco. "I used to work with several messy yellow pads," says Johnson, "but *Agenda* now lets me put down ideas at random and order them later, when I have time to think about structure."

Johnson, a self-confessed computer junkie, badgered his local Lotus representative for a copy of *Agenda* and learned how to use the program "in a weekend." In fact, most early users—admittedly a group of highly skilled computer users selected by Lotus Development Corp.—apparently took only a short time to become sufficiently familiar with *Agenda* to start using it actively. Software consultant Tabke says, "I got up to speed in two weeks."

For Johnson, an *Agenda* to-do list contains 60 to 70 items at any one time. The items are assigned to several categories, mostly by priority of action and due date, but also by customer. Now when a client calls, Johnson can bring up a view that puts at hand all the information about that specific customer and his or her real estate interests. That beats flipping back and forth through a yellow pad or even several yellow pads, says Johnson. "Having the data at my fingertips when a client calls," he adds, "improves my recall and makes me look super-efficient."

Johnson doesn't yet fully use *Agenda*'s notes facility, largely because of the time required to key in additional text. He says it would be useful to have as a note the details of a toxic-pollutant study relating to a particular building, for example. But, says Johnson, "I need someone else to take the time to input that amount of text."

You probably won't have this problem if you work with or can easily access ASCII files. In such cases, you can import the file as a note, or you can create a note file. *Agenda* supports path names, so if the ASCII file resides on your hard disk or on your network, you can link the note file to *Agenda*.

HIERARCHIES BOOST THE POWER

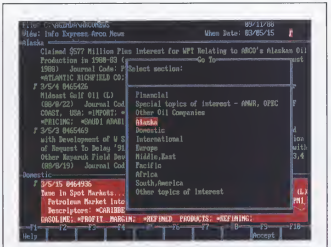
You can make a to-do list such as Johnson's more sophisticated by using columns to assign items to more than one category. A *Priority* column, for example, might include the word *high*, *low*, or *medium*. Or a *Name* column might list the people responsible for various actions. Each word in a column becomes a category, which you can use in another view to reorganize data. In this way, you can build a hierarchy of data as needed. Most important, you can change the hierarchy as your needs change.

That's the kind of action database used by Michael Butler, a consulting systems engineer with a major West Coast bank. Using *Agenda*, Butler has set up an "intelligent calendar" of activities he must act on or oversee today, this week, next week, within the next 30 days, and within the next 60 days. By using multiple assignments, Butler's calendar automatically brings items from the "next week" category into the "this week" category every Monday morning. "Monday mornings tend to be a little CPU-intensive," notes

Butler. With almost 200 items to update, he says, "*Agenda* gets to work hard for me." Butler's calendar is now a series of interlocking databases that include his phone list, expense reports, business and personal responsibilities, plus equipment purchases, equipment on loan, and a bug list for new software.

Butler keeps copies of his *Agenda* databases on a floppy disk so that he can work away from the office. He even took the program to an IBM National Technical Coordinator Update conference in Dallas earlier this year, where he collected notes on his laptop PC. Later in his hotel room, he expanded on the items by adding notes and assigning items by speaker, key words, session title, and so forth, for later reporting to his supervisors and his staff. "*Agenda*," says Butler, "gave me a simple way of customizing my reports for different people."

Johnson and Butler both take advantage of *Agenda*'s extensive, sophisticated date-handling capabilities. The program keeps track of three dates automatically: an entry date, which is the date you enter an item; a when date, which you specify for time due or any other crucial time; and a done date, which is recorded when you designate a task as completed. The program can automatically discard items with a done date or transfer them to a done file, thus allowing you to archive a record without cluttering up your working database. *Agenda* understands several kinds of date expressions, such as *tomorrow* or *the end of next week*.



A FILER FOR E-MAIL

ARCO's Richard Silverston has *Agenda* classify his mail and put a summary just a keystroke away.

UNOBTRUSIVE ARTIFICIAL INTELLIGENCE

Some of the power of *Agenda* derives from artificial intelligence (AI) techniques that may not be immediately obvious. For example, when you define a view, the program automatically tries to anticipate the category names. So if your database categories include "technology," "techniques," and "technicians," *Agenda* will display all of those names when you type the letter T and then E. By the seventh letter, *Agenda* will automatically choose the correct category.

That may seem trivial, but it can greatly speed up your interaction with *Agenda*. "The best type of AI is the unobtrusive variety," says Robert Flast, president of The Agendaware Specialists, Westfield, N.J., which developed *Top100 Guides*. "Automatic completion makes *Agenda* sensitive to the user."

Flast is a former vice president of technology for American Express, where he was responsible for developing AI tools for credit authorization. He was so impressed with *Agenda*'s AI aspects that he quit his job with American Express to write a book on the program—one of at least a dozen now under way—and to start developing commercial applications.

"The designers of *Agenda* have added complex logic without the usual gobbledygook of rule-based AI systems," notes Flast. "The user just won't be aware that artificial intelligence is at work."

To set up automatic assignment of items based on content or date, you instruct *Agenda* with conditions and actions. A condition might specify that the program assign an item to the "James" category if the word *manager* occurs. An action tells *Agenda* to do something with an item when it is assigned to a category. Thus, an action might specify that if an item is assigned to "James," it must also be assigned to the "personnel" and "vacation" categories. Using conditions and actions, says Flast, "can save a tremendous amount of work in organizing the database."

Flast notes that *Agenda*'s category manager uses another AI concept known as inheritance. The category manager permits a hierarchical organization of several families. A family consists of a parent category, such as "priority," and one or more child categories, such as "high," "low," and "medium." *Agenda* automatically builds a hierarchy based on the way you enter categories in creating a view. For example, when you create a column, the column head becomes a parent and the categories in the column become its children. The inheritance technique ensures that the parent category items include the items in a child category. But you can manipulate an item in either the parent or the child category without necessarily being aware of the hierarchy.

BORROWING FROM 1-2-3

Predictably, *Agenda* resembles *1-2-3* in several ways. The most obvious is a *1-2-3*–like menu bar at the top of the display and the command comments you see as

you highlight the menu options.

Agenda also has a macro capability. You can write a macro using the program's macro programming language. Or if you're not a programmer, *Agenda* will build a macro by capturing your keystrokes. A typical macro might set up the title and column headings to be used in printing the current view of a database, or it might set up a business memorandum format within a note.

Easy Software's Bard is not entirely satisfied with the macro capability, but his *Agenda* applications use macros extensively nonetheless. *The Builder's Organizer*, for one, contains more than a dozen macros, some of which have more than 100 commands.

Agenda's macro language is not too forbidding for an experienced programmer, says Bard. "My guess," he says, "is that someone who has already used a macro language with *1-2-3* or *dBase III* will be able to learn the *Agenda* macro language relatively easily." But Bard himself finds the language "not as supple as I would like." He cites the lack of a loop function and any internal counters as significant omissions.

> One of *Agenda*'s most powerful features is its ability to assign items as it recognizes key words.

IMPORTING FILES COULD BE EASIER

For nonprogrammers, the limitations of *Agenda*'s file-import capability are more important. The problem is that the program needs to know the format of an imported file so that it can, if necessary, sort the data into Items and notes.

Agenda has a utility named TXT2STF for doing this. The name stands for text-to-structured file, although several users prefer to call it "text to stuff." Unfortunately, the current version of TXT2STF accepts only ASCII files. For example, it will accept a *Symphony* PRN file but it will not accept a worksheet file. If the file has a format, such as the header and descriptor of a mail message, TXT2STF also needs a definition (DEF) file to specify which part of the mail message is to be an item—normally the header—and which parts are to be notes. Otherwise, *Agenda* treats every paragraph as an item. If the paragraph exceeds 350 characters, the rest of the paragraph automatically becomes a note.

You can use the same utility to help handle ASCII word-processing files. But if the files are not ASCII, you have to convert them first. Help for this situation may be coming from third-party software vendors, however. Andrew Hammond, who heads the *Agenda* market development program, says he expects several developers to offer utilities that will allow some of the more popular word processors to generate structured files directly.

Whoever does the job, ARCO's Richard Silverston and others hope for improvements in *Agenda*'s file-import capability. It's "on top of my wish list," says Dome's John Speer. And Silverston says he would like to be able to import directly not just word-processing files but also spreadsheet and graphics files.

PASTING IN A FILE

Actually, there is a way to get non-ASCII data into *Agenda*. The program comes with a pop-up program called Clipboard that operates under *Lotus Metro*, a desktop manager that has been offered by *Agenda*'s developer since 1987. *Metro*'s kernel, or basic module, comes with *Agenda*. After you install and load the kernel, Clipboard is resident in memory. When you see something in a word-processing file or spreadsheet that you want in your *Agenda* database, you can use Clipboard to capture the screen or any part of it. Later on, you can paste that data into *Agenda*.

Agenda also comes with another *Metro* accessory, called Items, which gives you a different kind of capability. If you're working in a file and are suddenly struck with an idea that you want in your database, you can pop up the Items accessory to record it. You can enter up to 10 items, each one up to 350 characters in length, and you can specify categories for each item. When you transfer those items to *Agenda*, it will read the category assignments as well.

Better data import is not the only item on the wish list for early *Agenda* users. Some would also like the program to display more columns. A view is now limited to the number of columns that fit on a screen. And some users would like more printing options.

Overall, though, early users of the program are enthusiastic. "*Agenda* is like an intellectual safety net for me," says Silverston, summing up. Above all, users cite the program's flexibility. "This is the kind of program you have to discover for yourself," says Bancorp's Lewallen. "No two people are going to use *Agenda* the same way—not even for similar applications." ■

Jeffrey N. Bairstow is a Boston-based free-lance writer and consultant.

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Analyze Your Database... Selectively

BY PETER G. AITKEN

The @D functions simplify the job.

Selective calculations are the domain of the database statistical @functions, also known as @D functions. Using an @D function, you can perform an analysis on a select set of data that is culled from tens or hundreds of database records. That may sound somewhat complicated or confusing, but don't be deterred. If you are familiar with the regular statistical functions—@SUM, @AVG, and so on—you have a head start on learning the @D functions, since they differ only in how they locate the data used in their calculations.

To understand how these functions operate, consider two examples. Look at the sample sales database in figure 1. To calculate total sales, enter the formula @SUM(D2..D13) anywhere on the worksheet. @SUM works great when the range to be totaled is contiguous, but how would you total only Smith's sales, which are scattered throughout the database? Use an @DSUM formula that locates every record in the database containing *Smith* in the *Name* field and adds the sales amounts for those records, to return a total of $5,225.

Review the @D functions and what they calculate, based on existing criteria:

Function	Calculates
@DSUM	the sum of the values
@DCOUNT	the number of nonblank cells
@DAVG	the average of nonblank cells
@DMIN	the minimum value
@DMAX	the maximum value
@DVAR	the variance of the values
@DSTD	the standard deviation of the values

Except for @DCOUNT, all of these functions apply only to cells containing numeric values. @DCOUNT, however, also applies to labels.

Using the @D functions, you can perform a wide range of sophisticated database analyses, such as:

- from an employee database, determine the maximum and minimum salaries of employees who have a college education and have been employed between three and six years
- from a mailing list, determine how many addressees live in a certain city, state, or zip code area
- from a real estate database, determine the average price paid for a ranch-style house sold in the first six months of the year

@D ARGUMENTS

A database statistical @function requires three arguments: the Input range (called the Database range in *Symphony*), the offset, and the Criterion range.

The Input range specifies the database containing the entries to be evaluated. This range includes the row of field names and all the records. Specify the Input range either as a range address (for example, A1..D13) or as a named range (for example, *input*), as shown in figure 1.

The offset specifies the column in the Input range containing the entries to be evaluated—that is, to be summed, averaged, or counted, for example. The leftmost field is offset Ø, the next is offset 1, and so on.

The Criterion range contains selection criteria that the @D function uses to

If you know the standard @functions, you have a head start.

GWYN STRAMLER

	A	B	C	D	E
1	Date	Name	Region	Sales	
2	28-Jul-85	Anderson	North	$9,000	
3	24-May-86	Smith	East	$1,200	
4	30-Jul-86	Wilson	East	$5,500	
5	08-Dec-86	Gerace	West	$4,350	
6	26-Jun-85	Stein	South	$900	
7	04-Feb-87	Smith	East	$1,500	
8	20-Feb-85	Gerace	West	$2,450	*input*
9	19-Apr-85	Anderson	North	$1,875	
10	18-Jun-88	Stein	South	$7,600	
11	23-Sep-86	Rigsbee	South	$6,600	
12	27-Jun-88	Baker	North	$3,200	
13	01-Aug-87	Smith	East	$2,525	
14					
15	Date	Name	Region	Sales	
16					
17				*criterion*	
18	Number of sales:		12		
19	Total sales:		$46,700		
20	Largest sale:		$9,000		

FIGURE 1. By entering criteria in this model's Criterion range (A15..D16) and using database statistical @functions (C18..C20) that reference the criteria, you can easily pull a variety of statistics out of the database.

	A	B	C	D	E
15	Date	Name	Region	Sales	
16		Smith			
17				*criterion*	
18	Number of sales:		3		
19	Total sales:		$5,225		
20	Largest sale:		$2,525		

FIGURE 2. With the label *Smith* in the Criterion range, only records containing *Smith* in the *Name* field will be evaluated. The @DCOUNT, @DSUM, and @DMAX formulas located in cells C18, C19, and C20, respectively, indicate that Smith had three sales, totaling $5,225, the largest sale being $2,525.

choose which database records to evaluate. Think of criteria as a test that records must pass. A Criterion range consists of an exact copy of the field names found in the Input range, followed by rows containing selection criteria—labels, values, or formulas. As with the Input range, specify the Criterion range either as a range address or as a named range, as shown in figure 1.

A SAMPLE SALES DATABASE

Now that you're familiar with the basics, let's build the sample sales database in figure 1 and test a few @D functions. Begin in a blank worksheet. Press slash and select Worksheet Global Column-Width, and enter *10* as the global column width. Then select /Worksheet Global Label-Prefix, and select Right to right-align the labels. (In *Symphony* press MENU and select Settings Width. Enter *10* and select Label-Prefix Right Quit.)

Next enter the data shown in range A1..D13, the Input range. Use the @DATE(year,month,day) function to enter the dates. Select the Date 1 format for range A2..A13, and then format range D2..D13 for currency with no decimal places. To format a range, select /Range Format (in *Symphony*, MENU Format), and specify the desired format.

To create the Criterion range, copy range A1..D1 to cell A15. In a moment you'll enter selection criteria in row 16.

Next assign range names to the Input and Criterion ranges. Doing so enables you to use range names rather than range addresses in the @D formulas. Select /Range Name Create (in *Symphony*, MENU Range Name Create), enter the name *input*, and specify range A1..D13. Similarly, assign the name *criterion* to range A15..D16.

Now suppose you need to answer the questions: What are the total number of sales? What is the total amount of sales? What is the largest sales amount? Finding these answers is simple when you let @DCOUNT, @DSUM, and @DMAX do the work.

To identify each calculation, enter the labels shown in range A18..A20. Format range C19..C20 for currency with no decimal places. Then enter the following formulas in the cells indicated:

Cell	Formula
C18	@DCOUNT(input,Ø,criterion)
C19	@DSUM(input,3,criterion)
C20	@DMAX(input,3,criterion)

Let's trace the logic of the @DMAX formula. It says to use the criteria specified in the range named *criterion* and return the largest value located in offset column 3, the *Sales* field, in the range named *input*. Because the Criterion range is blank, @DMAX selects all records for analysis. Of all of the values in the *Sales* column, $9,000 is the highest. The @DCOUNT and @DSUM formulas work similarly.

Because you haven't yet specified criteria, these examples are simple. As you will soon learn, by creatively using criteria you can instruct the @D functions to evaluate records that exactly match criteria, records whose values fall within a certain range, records that match either one or another criterion, or records that match two or more criteria.

EXACT MATCHES

In an exact-match criterion, the data in the specified field must exactly match the criterion that you enter in the Criterion range. For example, to evaluate only Smith's sales figures, enter *Smith* in cell B16 of the Criterion range. Your worksheet should then resemble figure 2.

The values returned by the database @functions change to reflect the new criteria. Smith had three sales totaling $5,225, with the largest sale being $2,525. To analyze Anderson's sales, enter *Anderson* in cell B16. Anderson made two sales, totaling

$10,875, with the largest sale being $9,000.

To analyze all sales made in the South, erase cell B16 and enter *South* in cell C16. The @functions update and tell you that the southern region had three sales totaling $15,100, the largest sale being $7,600.

Note that when matching labels, *1-2-3* Release 2/2.01 and *Symphony* are not case-sensitive. (This is not true for *1-2-3* Release 1A.) For example, records containing *SOUTH, south*, or *South* would all match the criterion *South*. In addition, all releases ignore differences in label prefix.

Always use an absolute reference in a criterion formula when referring to cells outside the database.

MATCHING A RANGE OF VALUES

When working with numeric values, such as in the *Sales* field, exact-match criteria are useful. But how do you select records in which a value falls within a certain range—for example, all sales greater than $2,000? You construct a criterion formula using one of the logical operators: = (equal to), < (less than), > (greater than), <= (less than or equal to), >= (greater than or equal to), <> (not equal to).

When you use logical operators in a criterion formula, you must include a relative cell reference to the specified field in the first record of the database. For example, to evaluate records in which sales are greater than $2,000, erase any existing criteria in row 16 and enter the formula +D2>2000 in cell D16. All logical formulas return either 1 for true or Ø for false. In this case, your worksheet displays 1 in cell D16 because cell D2 contains $9,000, which is greater than 2000. To make the logical formula more intelligible, format cell D16 to display the formula itself, not the result. Select /Range Format Text (in *Symphony*, MENU Format Other Literal) and specify cell D16. Using this criterion, your worksheet indicates that you have eight sales, totaling $41,225, with the largest sale being $9,000.

Now erase cell D16. To evaluate sales before May 1, 1986, enter the formula +A2>@DATE(86,5,1) in cell A16. Your worksheet displays Ø in cell A16 because the first sale in the first record occurred before May 1, 1986. Your worksheet indicates that you have eight sales, with a total amount of $32,475, and with the largest sale being $7,600.

SPECIAL SYMBOLS IN CRITERIA

The asterisk, question mark, and tilde are special symbols used in criteria that evaluate database fields containing labels. The asterisk and the question mark are wild cards. The asterisk stands for any group of characters; the question mark stands for any single character. The tilde reverses the meaning of the criteria. The following examples illustrate the use of special symbols.

Evaluate all records where sales were made by employees whose last name begins with S. First erase any existing criteria in row 16 and enter *S** in cell B16. To match this criterion, the first character of the salesperson's name must be S, but the asterisk indicates that the following characters can be anything. You use the asterisk wild card only at the end of the criterion because any characters following it are ignored. Your worksheet indicates that you have five sales, totaling $13,725, the largest sale being $7,600.

Suppose you want to calculate the total sales for one of your salespeople but can't remember whether the last name is Anderson or Andersen. Enter the criterion *Anders?n* in cell B16. The question mark indicates that any one character can be in the next-to-last position of the name for a database record to be evaluated. Anderson had two sales, totaling $10,875, the largest sale being $9,000.

Finally, the tilde reverses the meaning of the criterion; in other words, it says to select all records *except* those meeting the criterion. For example, to evaluate all records except those for the North region, erase the existing criteria, and enter *~North* in cell C16. The results show that 9 of the 12 sales were from outside the North region.

COMBINING CRITERIA

Sometimes you want to select database records based on multiple criteria applied to one field. Two logical operators, #AND# and #OR#, let you link two criteria within a single formula.

Use #AND# if the record must meet both criteria. For example, to evaluate records in which sales are between $2,000 and $3,000, erase existing criteria in row 16 and enter this formula in cell D16:

+D2>2000#AND#D2<=3000

Your worksheet indicates that two sales fall between $2,000 and $3,000, the total sales being $4,975 and the largest sale being $2,525.

Use #OR# if the record must meet only one of the criteria. For example, to select sales made in either the East or the West, erase the existing criteria in row 16, and enter this formula in cell C16:

+C2="East"#OR#C2="West"

Six sales were made in the East or West region. Note that when you use labels in a criterion formula,

Combine criteria to specify any conditions you want.

you enclose them in quotation marks. Also note that you cannot use labels in criterion formulas in *1-2-3* Release 1A.

Using the #NOT# operator, you negate a criterion. For example, to evaluate all records in which the sales amount is not greater than $2,000, erase the existing criteria in row 16 and enter the formula #NOT#D2>2000 in cell D16. Because "not greater than" is the same as "less than or equal to," a simpler, equivalent criterion is +D2<=2000. Both produce the same result: four sales were less than $2,000.

You can use #NOT# in combination with the other logical operators. For example, to evaluate records for sales by anyone other than Smith and Anderson, erase the existing criteria in row 16 and enter the following formula in cell B16:

#NOT#(B2="Smith"#OR#B2="Anderson")

Seven sales were made by salespeople other than Smith or Anderson.

MULTIPLE CRITERIA

Another, often simpler, way to specify AND and OR relationships between individual criteria is to use either multiple criteria on one row or multiple rows of criteria. Think of multiple criteria on one row as being linked by #AND# operators. If two or more criteria appear on one row in the Criterion range, a record must meet all of the criteria before it is selected. Similarly, a Criterion range may contain multiple rows of criteria. In that case, imagine that the rows are linked by the #OR# operator. To be selected, a record must meet the criteria on at least one of the rows. If you use *1-2-3* Release 1A, this is the method you use to evaluate fields containing labels.

Evaluate all of Smith's sales that were greater than $2,000. Erase the existing criteria in row 16, and enter *Smith* in cell B16 and *+D2>2000* in cell D16. Since the two criteria are in the same row, a record must meet both criteria to be selected. In this case, only one of Smith's sales qualifies.

Now, using multiple rows of criteria, let's analyze all sales in both the East and West regions. Erase the existing criteria in row 16, and enter *East* in cell C16 and *West* in cell C17. To include the criterion on row 17 in the analysis, expand the Criterion range to include row 17. Use the Range Name Create command, specify the range *criterion*, and indicate range A15..D17. This range now contains two rows for criteria. To be selected, a record must meet the criteria in at least one row. In this case, a record is selected if its region is East or West. Six records in the database meet the criteria.

Your criteria can be quite sophisticated. For example, to select all records in which sales were made in the North before January 1, 1986, as well as all records in which sales were made in the South after January 1, 1986, erase the criteria in rows 16 and 17 and enter the label *North* in cell C16, the label *South* in cell C17, and the formula +A2<@DATE(86,1,1) in cells A16 and A17. For a record to be selected, it must meet both conditions in row 16 or both conditions in row 17. Three records meet the criteria.

A note of caution: If you erase criteria from row 17, all records will be selected from the database because all records meet the empty criteria. Therefore, if you have used two rows for criteria and then need to use only one, respecify the Criterion range to include only the row of field names and the row below them.

As you've seen, criteria containing logical formulas refer to cells in the first record in the database. However, criteria can also refer to cells outside the database. For example, you may want to evaluate records based on a value calculated elsewhere on the worksheet. To do so, use the appropriate absolute cell reference in the criterion.

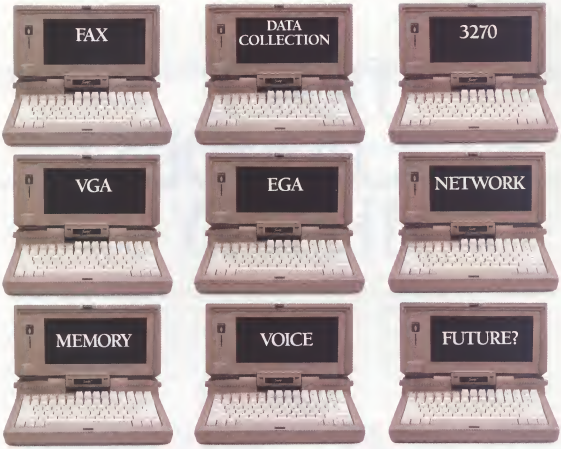
For example, suppose a range named *values* contains a list of numbers whose average you want to use to evaluate records. Enter the formula +D2>@AVG ($values) in cell D16 of the Criterion range.

THREE TIPS FOR CRITERION RANGES

Since the workhorse of the @D arguments is the Criterion range, give some thought to its use. First, although it's not necessary to do so, include every field name from the Input range in the Criterion range. Then you have the flexibility of choosing which columns to use for analysis. Second, to avoid typing errors, use the Copy command to copy the field names from the database to the Criterion range.

Third, use the Range Name Labels Down command to assign the field names to the corresponding cells in the first record of the database. Then you can use the field names instead of cell references when you enter formulas in the Criterion range. For example, instead of entering *+D2>2000*, you could enter *+Sales>2000*. (Note that if you're working in a *Symphony*-generated FORM database, the program automatically assigns these range names.) ■

Peter G. Aitken wrote about 1-2-3's global settings in the July issue of LOTUS.



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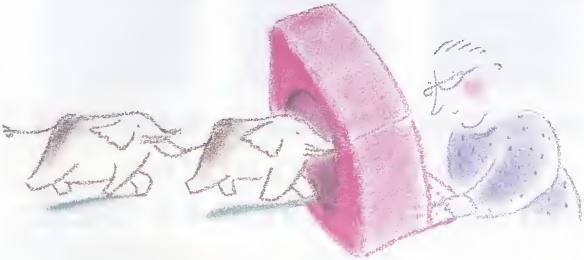

BY PAULA DEMPSEY

Managing your computer's memory is like managing your money. Fritter it away, and you'll wonder where it went. Carefully plan and budget, and you'll have enough to cover your needs. As much as you'd like to be a spreadsheet planner and memory miser, you may currently be a spendthrift who gazes in horror when the flashing MEM indicator or the *Memory full* message appears.

Squandering memory is easy to do, especially if you aren't aware of how it happens. This article will explain ways you can waste memory and how you can recover it. Being frugal pays big dividends: You can create larger, more efficient worksheets that not only fit into memory but also recalculate faster.

First let's define memory. Internal memory, or RAM, which is short for random-access memory, is where the computer temporarily stores a worksheet while you work on it. Turn off your computer, and the worksheet vanishes from your screen, as well as from memory. Disk storage refers to the space on a floppy or hard disk where you save a permanent copy of a worksheet.

Both internal memory and permanent media—floppy and hard disks—measure memory space in bytes. A byte is the amount of memory required to store one character. One kilobyte, or 1K, equals 1,024 bytes. One megabyte equals 1,000K, or 1,024,000 bytes. However, remember that *1-2-3* and *Symphony* store worksheets in RAM while you develop or use them. Thus, even if you use a 30-megabyte hard disk, you cannot create a worksheet that is larger than the available RAM.

DOS and programs that run under DOS can address only 640K of conventional memory. Some applications programs store data in extended or expanded memory. However, even if your system has one of these types of memory, you still should conserve conventional memory.

The memory left over after you start up DOS, install

Paula Dempsey helped us determine our Lotus Quotient in the June issue.

MERLE NACHT

THESE 11 TIPS HELP YOU SQUEEZE MORE INTO RAM.

memory-resident programs, and load *1-2-3* or *Symphony* is the memory available for creating worksheets. To see how much memory that is, press slash and select Worksheet Status (in *Symphony* press SERVICES and select Settings). The screen will display various pieces of information, including the number of bytes of available conventional memory. Jot down this number, retrieve a worksheet, and again select /Worksheet Status (in *Symphony*, SERVICES Settings). Subtract the displayed amount of memory from the amount you previously recorded to derive the amount of memory the worksheet is using. If you are still developing or adding data to the worksheet, the difference between the amount of memory it currently occupies and the amount of memory that remains indicates how much data you can add.

FIND THE ACTIVE AREA

When you're trying to save memory, knowing how *1-2-3* and *Symphony* allocate memory within a worksheet is essential. Both products allocate memory to active areas of the spreadsheet that contain data or cell formats, but different releases use different memory-allocation schemes. *1-2-3* Release 1A and *Symphony* Release 1/1.01 allocate memory to one large active area. All other releases of *1-2-3* and *Symphony* assign memory to many small active areas.

If you use *1-2-3* Release 1A or *Symphony* Release 1/1.01, compress data into the upper-left corner of the worksheet. These releases assign memory to one large active area, which you find by pressing the End key, followed by the Home key. The pointer moves to the lower-right corner of the active area; cell A1 is always the upper-left corner. Suppose your worksheet contains only the label *Test* in cell Z1000. Range A1..Z1000 is the active area, and thousands of blank cells in the range occupy memory.

If you use *1-2-3* Release 2/2.01 or *Symphony* Release 1.1, 1.2, or 2, don't leave large gaps between cell entries that are in the same column. Imagine, for example, that your worksheet contains only the label *Test* in cells A1 and A1000. These two entries use 4,012 bytes of memory because *1-2-3* and *Symphony* determine that range A1..A1000 is the active area. Although 998 cells in that range are blank, 1,000 cells occupy internal memory. These versions of *1-2-3* and *Symphony* do, however, ignore gaps between data in different columns. Imagine that your worksheet contains only the label *Test* in cells A1 and IV1. These entries consume only 44 bytes of memory because the program allocates memory to two small active areas, one in column A and one in column IV. To carefully manage your available memory, implement the following tips.

1 Decrease the active area.

After pressing End-Home, if you discover that the active area of your worksheet is larger than necessary, use one of these two methods to decrease it. The easier method is to delete unnecessary blank columns and rows contained in the active area and then save and retrieve the file. An alternative method is to use the File Xtract command to extract only the portion of the worksheet that you wish to save. Specify a new file name, and *1-2-3* and *Symphony* will create a more compact worksheet.

2 Minimize cell formatting.

Although assigning cell formats enhances the readability of your data, it also renders a cell active, whether or not the cell contains data. Each blank, formatted cell consumes 4 bytes of memory. Therefore, assign formats only to cells that contain, or will contain, numerical entries. Assign the format required by the majority of worksheet cells as a global format by selecting /Worksheet Global Format (in *Symphony*, MENU Settings Format). Assign other formats only as necessary to individual ranges.

3 Save and retrieve the worksheet.

If you use the Range Format Reset (in *Symphony*, Format Reset) command to erase cell entries or reset formats, save the worksheet and then retrieve it to recover some memory.

4 Limit range names.

Since each range name uses 33 bytes of memory, assign a range name only when necessary and delete it if you no longer need it. For a list of the named ranges in a worksheet, move the pointer to an unused area and select /Range Name Table (in *Symphony*, MENU Range Name Table). Then select /Range Name

Delete (in *Symphony*, MENU Range Name Delete) to delete unnecessary named ranges.

In *1-2-3* Release 1A, locating unnecessary named ranges is more laborious. Select /Range Name Create, and a line of named ranges appears. One by one, position the pointer on each name and press Return to view the area of the worksheet assigned to that name. Delete those that are unnecessary.

5 Write compact formulas.

Usually, the best way to create a compact formula is to use the correct @function. Here's an example that works in *1-2-3* Release 2/2.01 and *Symphony*.

	A
1	01-Nov-88
2	
3	Tue

Set the width of column A to 10: With the cell pointer in column A, select /Worksheet Column Set-Width (in *Symphony*, MENU Width Set) and enter *10*. Enter the formula @DATE(88,11,1) in cell A1, and assign the Date 1 format to that cell.

This nested @IF formula, which is located in cell A3 and consumes about 150 bytes of memory, is one way to display a label indicating the day of the week:

```
@IF(@MOD(A1,7)=Ø,
  "Sat",@IF(@MOD(A1,7)=1,
  "Sun",@IF(@MOD(A1,7)=2,
  "Mon",@IF(@MOD(A1,7)=3,
  "Tue",@IF(@MOD(A1,7)=4,
  "Wed",@IF(@MOD(A1,7)=5,
  "Thu","Fri"))))))
```

The following compact formula uses only 70 bytes of memory and is more efficient:

```
@CHOOSE(@MOD(A1,7),"Sat","Sun","Mon",
  "Tue","Wed","Thu","Fri")
```

For more on memory-efficient formulas, see "Streamlining Formulas" in the February 1986 issue.

6 Convert formulas to values.

Formulas use more memory than values. Therefore, if the data used in your formulas won't change, convert the formulas to values. Unless you use *1-2-3* Release 1A, use the Range Value (in *Symphony*, Range Values) command to accomplish this. Let's consider an example.

	A	B	C	D	E	F
1	First Quarter Sales					
2	----------					
3		Wabash	Natick	Cost	Total	
4	Fan belts	22	34	$12	$672	
5	Hoses	41	29	$8	$560	
6	Spark plugs	12	14	$2	$52	
7	Wipers	30	30	$6	$360	
8	Total				$1,644	

Column E of this worksheet contains a series of formulas that calculate total sales per item. If you're sure that you won't be changing the data in columns B through D, convert the formulas in column E to values. Select /Range Value (in *Symphony*, MENU Range Values). Specify range E4..E8 as the From range and cell E4 as the To range. All of the formulas will be replaced by their current values.

In *1-2-3* Release 1A, use the EDIT-CALC key combination or the File Xtract and Combine commands to convert formulas to values. To convert a single cell, position the pointer in the cell, press the EDIT key, then the CALC key, then Return. To convert the range of formulas in the example shown above, select /File Xtract Values. Enter a file name that is not in use—for example, *vals*. Specify range E4..E8 as the range to extract. Then position the pointer on cell E4. Select /File Combine Copy Entire-File, and enter the name of the file that contains the extracted values—in this case, *vals*. *1-2-3* replaces the formulas with values.

7 Store data in separate worksheets.

Although this tip saves memory, the nature of your application dictates whether or not it is feasible. Suppose you need financial statements for each branch of your organization, as well as for the organization as a whole. Enter the data into identically structured worksheets and save them as separate files. Then use the File Combine Add command to sum the numbers in corresponding cells of separate worksheets. By doing so, you avoid building one huge model. For more on the File Combine command, see "Consolidating Worksheets" in the May issue.

8 Bypass the Access system.

Depending on which product you use, you can save an average of 6.5K of memory if you enter *123* or *symphony* at the DOS prompt to go directly into the spreadsheet. If your computer automatically loads *1-2-3* or *Symphony* and places you at the Access system, your AUTOEXEC.BAT file contains either the command *lotus*, which starts *1-2-3*, or *access*, which starts *Symphony*. Use a text editor, such as DOS EDLIN, to edit the batch file and change the command *lotus* to *123* or the command *access* to *symphony*. For more on editing batch files, see "All About EDLIN" in the February issue and "Batch Files...Not Just for Experts" in the October issue.

9 Create a small driver set.

A driver set in *1-2-3* Release 2/2.01 and *Symphony* Releases 1.1, 1.2, and 2 can include as many as four text and four graphics printer drivers, each of which uses 1K to 2K of memory. If, for example, your system includes a dot-matrix printer and a laser print-

INTERNAL MEMORY
LIMITS WORKSHEET SIZE.

er, you probably have drivers for both devices in your driver set. Instead of using one large driver set, use smaller sets, each containing the driver for one device. For example, include the driver for the dot-matrix printer in the default driver set (123.SET for *1-2-3*, LOTUS.SET for *Symphony*), and include the driver for the laser printer in a set named LASER.SET. To use the dot-matrix printer, start *1-2-3* or *Symphony* as you normally do. To use the laser printer, enter *123 laser* or *symphony laser* at the DOS prompt.

If you use a dual-floppy-disk system, the *1-2-3* System Disk or the *Symphony* Program Disk may have room for only one driver set. If so, save the alternate driver set for your laser printer on a separate disk. When you start *1-2-3* or *Symphony*, insert the System or Program Disk in drive A and insert the disk that contains the alternate driver set in drive B. Then type *123 b:laser* or *symphony b:laser* at the DOS prompt.

10 Unload memory-resident software.

Memory-resident programs, such as spelling checkers and desktop-accessory packages, consume valuable memory that your worksheet might need. If you manually load memory-resident programs, don't load them if you're about to work on a large worksheet. If your AUTOEXEC.BAT file contains commands that automatically load memory-resident programs, edit the file, removing the commands that load these programs, and restart the system.

HOW MUCH DOES IT USE?

Spreadsheet Structure	Bytes Used
Blank, active cell	4
Label:	
1-2-3 Release 2/2.01	2 + 1 per character
Symphony Release 1.1, 1.2, 2.0	2 + 1 per character
1-2-3 Release 1A	6 + 1 per character above 6
Integer between −32,768 and 32,767	4
Real number	8 to 12
Formula	Variable (20 to 30 minimum)
Range name	32 to 33
Add-in	34 + add-in size
Graph settings	460 to 483
Symphony window	490
Symphony print settings	663
String-returning formula	1 + 1 per character

11 Use earlier versions of DOS.

Earlier versions of DOS require less memory than later versions. For instance, running *1-2-3* with DOS 2.0 rather than DOS 3.0 saves about 12K. Check the system requirements listed in your software's documentation, and use the earliest version of DOS that will support the software.

TWO HARDWARE SOLUTIONS

When these 11 tips fail to free enough memory for your worksheet, consider two remaining solutions: upgrade to 640K or install expanded memory.

To determine how much conventional memory your system has, use the DOS CHKDSK command. On a dual-floppy-disk system, insert the DOS disk in drive A and enter *chkdsk* at the DOS A> prompt. On a hard-disk system, switch to the directory that contains DOS and enter *chkdsk*. The second to the last line of the listing indicates how many bytes of conventional memory DOS is addressing.

If your system already has 640K of memory, the line reads *655360 bytes of memory*. For example, if the line reads *524288 bytes of memory*, divide that number by 1,024. The result is 512, which indicates that your system has 512K of conventional memory. Install an additional 128K to upgrade to 640K of memory.

If you install an expanded-memory board that adheres to the Lotus/Intel/Microsoft Expanded-Memory Specification and use *1-2-3* Release 2/2.01 or *Symphony* Release 1.1, 1.2, or 2.0, you can load a spreadsheet that exceeds the 640K limit. But be aware of a few catches. *1-2-3* and *Symphony* store only labels, formulas, and real numbers in expanded memory. *Symphony* 2.0 also stores range names, settings sheets, and program data such as menu text and associated long prompts, window names and locations, and database settings. Conventional memory holds everything else, including pointers that direct DOS to the location of the data in expanded memory. Even if your computer has 4 megabytes of expanded memory, the *Memory full* error still appears if conventional memory is depleted.

As these tips demonstrate, memory management requires careful planning and budgeting, activities best done before *Memory full* signals that your account is overdrawn. ■

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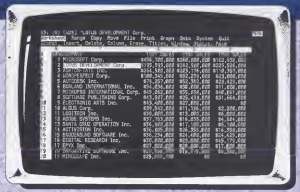
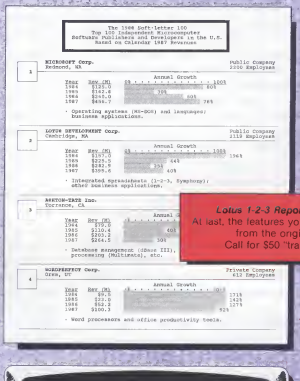


A Lotus database is a range or an entire worksheet having field names in the first row and records of data in rows below.



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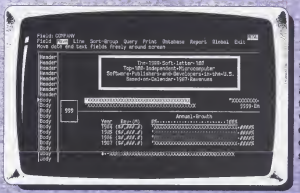


A report writer is a tool that lets you specify what data to select, what additional calculations to perform, where to place everything, and exactly how it should look.

Trademarks: Lotus, 1-2-3, Symphony, Lotus Report Writer by Lotus Development Corporation; IBM by International Business Machines Corporation; dBASE by Ashton-Tate. R&R Relational Report Writer and R&R Worksheet Report Writer by Concentric Data Systems, Inc.

Q&A

ANSWERS TO YOUR QUESTIONS ABOUT LOTUS PRODUCTS

SYMPHONY

INIT ERROR MESSAGE

Q. I was following the manual's instructions for initializing *Symphony* Release 2.0 and received the error message *Unable to locate or open driver set. Press any key to continue.*

Could my *Symphony* Program Disk be defective?

Samuel J. Karsbis
Polonsky and Karsbis
Malden, Mass

A. To initialize *Symphony*, you must be at an A> prompt and have the original *Symphony* Program Disk in drive A. Type *init* and press Return. If you receive the same error message, there may be a problem with a file on your *Symphony* Program Disk. Before requesting a replacement disk, try the following:

1. Use the DOS DIR command to get a directory of the *Symphony* Program Disk. If the file named LOTUS.SET is not there, copy it from the PrintGraph Disk to the Program Disk and repeat the initialization procedure.

2. Restart your system with an original DOS disk in drive A to insure that no other programs are loaded, then repeat the initialization procedure.

3. At the A> prompt, enter *init lotus* or, if you've given your driver set a name, enter *init* followed by the name of your driver set.

RESTRICTING DATABASE ENTRIES TO ODD OR EVEN

Q. I need to enter a formula into the *Validity* column of the Definition range in my *Symphony* database. I want *Symphony* to determine if the sum of four digits (which I enter as a label through a FORM window) is an odd or even number and then reject the entry if the sum is even. For example, the sum of the digits 1114 is equal to 7, an odd number, so the entry will be accepted. Can you help?

David Pauls
Montgomery, Ala.

	A	B	C	D	E	F	G	H
9	Name	Value	Type	Default	Formula	Validity	Input	Prompt
10	Name		L:15					Enter Name
11	Order Number		L:4			ERR		Enter Order
12	Total Amount		N:10					Enter Amount

A. In the figure above, the following formula entered into the *Validity* column (cell F11) will allow an entry into the *Order Number* field only if the sum of the four digits is an odd number. The formula will initially return ERR.

```
@MOD(@VALUE(@LEFT(B11,1))
+@VALUE(@MID(B11,1,1))
+@VALUE(@MID(B11,2,1))+
@VALUE(@RIGHT(B11,1)),2)
```

The @LEFT, @MID, and @RIGHT functions isolate each digit, and the @VALUE function converts each into a value. *Symphony* adds the values and determines whether the sum is an odd or even number.

To allow for even-sum entries only, add =Ø to the end of the formula.

GLOBAL PROTECTION

Q. I've created *Symphony* templates that other people in the company use. Each spreadsheet contains formulas that others should not change. Also, users must enter a lot of data each time they use the spreadsheet. I can protect the entire spreadsheet and then unprotect the cells that need data input. However, every time I edit the formulas, I must unprotect the entire spreadsheet and then go through the process of protecting and unprotecting again. Is there a faster way to do this and a way around global protection?

Sandra Tegland
Science Applications International Corp
San Diego, Calif

A. When you wish to edit a formula, simply select SERVICES Settings Global-Protection No Quit. You then can edit formulas in any cells. When you finish editing, select SERVICES Settings Global-Protection Yes Quit. Unprotected cells remain accessible to any user, and protected cells become off-limits.

1-2-3

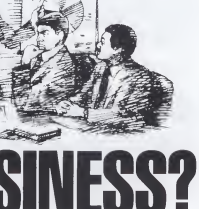
DISPLAYING THE 1-2-3 MENU

Q. We tried to begin a cell entry with a less-than sign (<), but when we held down the Shift key and pressed the comma, the main menu appeared. We can begin a cell entry with the greater-than sign (>). The *1-2-3 Reference Manual* doesn't mention this feature. Have we found a bug in the program?

Scott Miller
Carl Cucuzza
Norcross, Ga

A. In *1-2-3* Release 2/2.01, pressing the Shift key and then comma in Ready mode displays the menu. This feature is intentional. It gives you access to the *1-2-3* menu if your keyboard lacks a slash key. If you want to begin a cell entry with the less-than sign, you must type a label prefix (apostrophe, caret, quotation mark, vertical bar, or back-

DOES HE REALLY KNOW THE BUSINESS?



President Davis had just announced a stellar acquisition and was just finishing his speech as the room rang with applause. "What a great job he did," said the Sales Manager, echoing the sentiments of everyone there.

It was my turn, as the new Division Manager, to offer my assessment. I strode confidently to the front as they murmured in amazement.

"Does he really know the business?" I heard the Information Officer whisper to Davis. "Well, he's never run a profit center in his life, but he's prepared. just listen," said Davis.

"Michael is in way over his head," somebody whispered. The other vice presidents agreed. They were sure I didn't know a liquid asset from a bottle of spring water.

I scanned the room deliberately, making eye contact with everyone there. I cleared my voice, paused, and said, "Good Morning.

Almost immediately, a hush fell over the room as I opened with a brilliant synopsis of our corporate mission, the acquisition and how it would affect our bottom line. I wowed them with an analysis of our competition and critical need for a heavy investment into R & D.

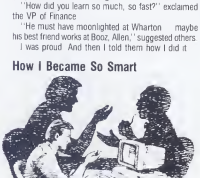
My colleagues sat spellbound. As I continued, I actually forgot the hour and the place. When I finished them off with my analysis of how better managing our overtime costs would positively impact cash flow, their gasps of amazement brought me back.

"How did you learn so much, so fast?" exclaimed the VP of Finance.

"He must have moonlighted at Wharton maybe his best friend works at Booz, Allen," suggested others.

I was proud. And then I told them how I did it.

How I Became So Smart



"When we started to talk about the acquisition," I explained, "I wanted to better understand the business we might be getting into. I saw a segment on ABC News one Sunday morning on how executives were using Business Week's Business Advantage software. It's a new way to understand business that's now used at IBM, AT&T, Phillip Morris and others. MBA students at Wharton and other top business schools use it. Even venture capitalists and bankers are relying on it to better understand their investments."

"So, I ordered the software and used it. I began to understand better how my sales promotions were causing havoc in operations, why, due to our debt payments, our profit sharing is so low, and how a sudden jolt in the economy could hurt our distributors."

The audience nodded with approval. I had won their support.

I explained that Business Week's Business Advantage allowed one to become an accomplished executive in a fraction of the time. "I'm convinced that simulation is the best way to learn and test yourself without risking the assets of our company in the process," I added.

"Tell us more," said a newly interested Davis.

I pointed out that some 10,000 business people were using Business Week's Business Advantage to help them understand how to make better business decisions.

I had sold them on the program—and, on me!

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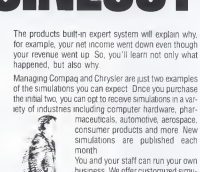

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slash) as the first character. You won't have a problem when you use the less-than sign in the middle of a formula.

OVERRIDING 100-LINE MAXIMUM PAGE LENGTH

Q. Is it possible to override *1-2-3*'s maximum page length of 100 lines per page? I use legal-size paper and enter a set-up string to get 112 lines per page.

Bruce Nesbit
Albuquerque, N.Mex.

A. Select /Print Printer Options Other Unformatted to suppress page breaks, top and bottom margins, and header and footer lines. For Print ranges that are longer than 112 lines, you will have to create page breaks by inserting blank lines in the worksheet. In *1-2-3* Release 2/2.01, you can enter a page-break symbol by selecting /Worksheet Page.

1-2-3/SYMPHONY

PERMANENTLY CHANGING PAGE-LENGTH DEFAULT

Q. Prior to printing any spreadsheets, I must change the page-length default from 66 to 62 lines. Is there a way to permanently change the default to 62 lines per page?

Jay Mayer
Edison, N.J.

A. Select /Worksheet Global Default Printer Pg-Length. Enter *62*, select Quit Update Quit. (In *Symphony* select SERVICES Configuration Printer Page-Length, enter *62*, and select Quit Update Quit.) By selecting Update you save your change to the configuration file; it remains in effect until you change it again.

WHERE'S THE GRAPH?

Q. Using *1-2-3* Release 2.01, I created a simple line graph with an X range and one data range. When I selected View from the Graph menu, neither the data points nor the lines connecting them appeared on the graph. What could have caused this?

Patricia Lyons
Chilmark, Mass.

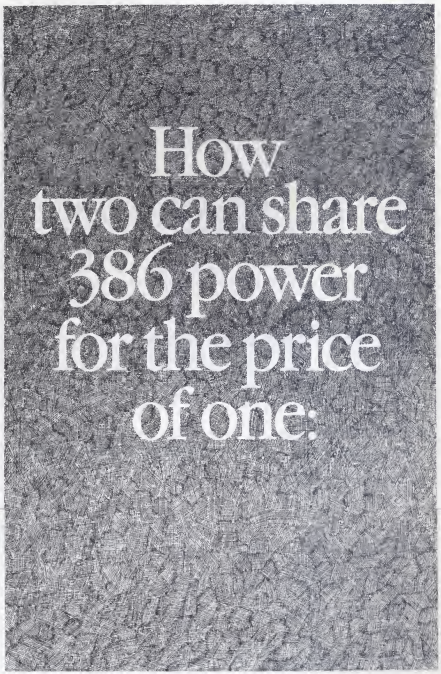
A. If you select /Graph Options Format Graph Neither Quit Quit, neither symbols nor lines will appear in your graph. Selecting /Graph Options Format Graph, then pressing the Escape key and selecting Quit Quit has the same effect as selecting /Graph Options Format Graph Neither.

To display symbols and lines for all ranges of the graph, select /Graph Options Format Graph Both. If you want to display only symbols representing the data points, select /Graph Options Format Graph Symbols. To display just the lines connecting the data points, select /Graph Options Format Graph Lines.

In *Symphony* select MENU Graph 1st-Settings Format, specify the range, and then choose Lines, Symbols, Both, or Neither.

@STD FUNCTION ERROR

Q. I have come across a problem using the standard deviation function in *1-2-3* Release 1A. The @STD formula returns ERR when it refers to a list of values that are equal. If all values in a column are equal, shouldn't the standard deviation



be Ø? What causes this problem and is there a solution?

	A	B
1		7.3333
2		7.3333
3		7.3333
4		7.3333
5		
6	@STD	ERR
7		
8	@VAR	-0.000000000000004

Trevor Jones
Midlothian, Va.

A. Under certain circumstances, the @STD function will return ERR in all releases of *1-2-3* and *Symphony*.

The standard deviation of a set of values is the square root of the variance. When the variance is Ø, the standard deviation is also Ø. A list of values that are equal should have a variance of Ø. The standard deviation should also be Ø.

A problem may occur because of floating-point arithmetic, which is the set of algorithms microcomputers use to handle values. These algorithms can give rise to stray digits in the 14th and 15th decimal places. In your example, because of floating-point inaccuracies, the variance of range B1..B4 is not equal to Ø. If you assign a Fixed format with 15 decimal places to cell B8 and widen column B to a width of 20, you reveal that the formula returns a small negative number. *1-2-3* returns ERR when it calculates the square root of this value (the standard deviation of the values in range B1..B4) because the square root of a negative number isn't a real number.

To work around the floating-point error, enter the following formula in cell B6:

@SQRT(@ROUND(@VAR(B1..B4),11))

This formula calculates the standard deviation by rounding the variance to 11 decimal places and taking the square root of that value.

COMBINING RANGE NAMES

Q. I combine a spreadsheet that contains macros into other spreadsheets that contain data. After doing this, I have to run a macro that names the other macros.

Is there a way to combine the spreadsheet, as well as its range names, when I combine it into another spreadsheet? I use *1-2-3* Release 2.01.

Ken Bates
Olympia, Wash.

A. The File Combine command in *1-2-3* combines cell entries only. You must reassign the missing range names once you combine spreadsheets. If one of the macros you combine can assign range names for other macros, you'll need to assign only one range name after combining the files.

All releases of *Symphony* let you combine range names along with cell entries when you combine files.

WHERE IS THE STEP KEY?

Q. The *1-2-3* Release 2.01 manual refers to the STEP key as a tool to help debug a macro. I use an IBM Enhanced Keyboard, which has the number pad on the right and function keys across the top of the keyboard. Where is the STEP key?

Anita Kodas
Boy Scouts of America
Kansas City, Kans.

A. You press STEP by holding down the Alt key and pressing F2. The STEP indicator will appear at the bottom of the screen. When you invoke a macro while the STEP indicator is present, the macro processes only one step each time you press a key. After each step, the macro pauses and the flashing SST indicator replaces the STEP indicator at the bottom of the screen. (In *Symphony* a flashing *Pause* indicator replaces the *Step* indicator.) To end *Step* mode, press STEP (Alt-F2) a second time. (In *Symphony* the STEP key is Alt-F7 on the IBM Enhanced keyboard.)

USING A VARIABLE IN A FORMULA'S CELL ADDRESS

Q. Can I use a variable as part of a cell address in a formula? In the example that follows, column A contains various diameters of circles. I would like to enter a row number in cell B1 and have a formula in cell C1 use that row number as part of a cell address to calculate the area of a circle.

	A	B	C	D
1	1.00	8	5.94	
2	1.25			
3	1.50			
4	1.75			
5	2.00			
6	2.25			
7	2.50			
8	2.75			
9	3.00			

H. Espinoza
International Engineering Co.
San Francisco, Calif.

A. Enter this formula in cell C1:

@PI*(@@("A"&@STRING (B1,Ø))/2)^2

1-2-3 Release 2/2.01's and *Symphony*'s string concatenation allows you to use a variable as part of a cell address in a formula. The @@ function converts the string into a cell address, which the formula uses as a valid argument. The formula in cell C1 is updated automatically when you change the value in cell B1.

Q&A REVISITED

DISPLAY OF RANGE NAMES

Q. In December 1987 and May 1988, you explained that files whose names begin with an exclamation point appear first in the control panel during file-retrieving operations. Since my *1-2-3* Release 2.01 spreadsheets generally have many range names, I wanted a way to keep specific range names at the beginning of the control-panel list.

Because preceding a range name with an exclamation point doesn't do the job, I experimented and found that the asterisk does.

Fred Kracker
Charlotte, Mich.

A. We strongly urge our readers to avoid using arithmetic operators in range names. The asterisk means "multiply" to your software's formula parser and to people who are familiar with using *1-2-3* or *Symphony*. It can be confusing to decipher a formula that contains both multiplication symbols and these unusual range names.

You can use an exclamation point as the first character of a range name, but such range names require unique treatment when you use them in formulas and command sequences.

1-2-3 and *Symphony* interpret an exclamation point to mean "convert this reference to a range reference." Imagine that you've assigned the name *costs*

to cell A1. When you enter *@S(!costs)* into the worksheet, the formula parser strips off the exclamation point and interprets *costs* as the range reference A1..A1.

If you assign the name *!total* to range C9..E9, you risk confusing the formula parser. When you enter the formula @SUM(!total) into the worksheet, the formula parser strips out the exclamation point and tries to enter the formula @SUM(total). This formula doesn't work because a range named *total* doesn't exist in the worksheet. You can get the formula parser to accept the range name if you enter the formula as @SUM(!!total). Likewise, when you assign *!!total* as a Print range, you must precede the word *total* by two exclamation points.

UNWANTED PAPER-FEED WHEN PRINTING WORKSHEET

Q. In the April issue, Danielle Mankus asked why her printer advances the paper a half page, a full page, or even as many as three pages when she selects /Print Printer. When I had this problem, I found that I'd included several hidden columns at the end of my Print range. For example, when I printed range A1..AB75, and columns X through AB were hidden, the printer advanced an extra page. Once I reduced the Print range to A1..W75, the paper no longer advanced the extra page.

Barbara F. Johnson
Fidelity Bankers Life
Richmond, Va.

A. Thanks for the added information. However, we were unable to duplicate the problem by printing hidden columns.

FORMULA TOO LONG

In reference to Rhonda Conventry's question "What Formula Is Too Long?" [April], I've received the error message *Formula too long* several times. I followed the steps you described for creating a table of range names and discovered another solution to the problem.

When I created the table of range names, I discovered that one of the named ranges in my spreadsheet extended to cell IV8192. I deleted that name, and the error condition vanished. When you create the range-name table, the cause of your problem may be obvious.

Stephen A. Marinshaw
Grand Prairie, Tex

@SUM WITH VARIABLE START/END CELLS

Q. In the July issue, you gave a macro solution to Fred Cheney's question on how to use variable beginning and ending cells in an @SUM formula. I use a nonmacro method to create an @SUM formula with variable ranges.

In the following figure, cells B1 and C1 contain values that correspond to the starting and ending row numbers of the range to sum. The numbers to sum are in column A. Cell A7 contains a formula that uses string concatenation to generate a label representing the range to sum ("A1..A5"). The @@ function converts that label to cell references, which behave as the argument of the @SUM function:

```
@SUM(@@("A"&@STRING(B1,0)
&"..A"&@STRING(C1,0)))
```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	A	B	C
1	1	1	5
2	2		
3	3		
4	4		
5	5		
6	=========		
7	15		

To sum a different range in column A, change the numbers in cells B1 and C1. The formula in cell A7 is updated automatically and refers to the new range.

Paul Wilkerson
West Texas Utilities Co.
San Angelo, Tex.

A. This method works in *1-2-3* Release 2/2.01 and all releases of *Symphony*.

CELL ENTRY ERROR

Q. In the April issue, Donald Batal asked how to put dates (such as 6/87) into a database and not have them interpreted as formulas. You said to press EDIT Home and enter a label prefix to make each entry a label. I suggest the following alternative: When you create a database, enter the dates and let them be interpreted as formulas. Then use the Range Format Text command (in *Symphony*, MENU Format Other Literal) to format the entries. Each of the formulas will be displayed as dates.

Terri Witzberger
Norton, Ohio

A. You can't use formatted formulas or dates that have the added label prefix in date-arithmetic operations. Refer to the April Contest results in the July issue and to the October Q&A called "April Contest Applied." These items discuss ways to convert date labels to valid serial numbers.

CONTEST

AUGUST CONTEST RESULTS

In the August issue we asked users of *1-2-3* Release 2/2.01 and *Symphony* to submit the best criterion formula for selecting all records from a database that *do not* contain a particular string. Readers were asked to use the following example to construct the winning formula.

Cell E1 (right) contains the formula @DCOUNT(dbase,Ø,crit), where the Input range (Database range in *Symphony*), *dbase*, is range A1..B7 and the Criterion range, *crit*, is range D1..D2. The Output range is specified as range D4..E4, and range D5..E7 contains the extracted records. Cell D2 is to contain the criterion formula that selects all records from *dbase* that do not contain the string *pet*. The winning formulas are either @ISERR(@FIND("pet",A2,Ø)) or @ISERR(@FIND("pet",word,Ø)), where *word* is the range name for cell A2.

	A	B	C	D	E
1	Word	Number	Word		3
2	peter	4			
3	permanent	5			
4	ponder	6	Word	Number	
5	prolong	3	permanent	5	
6	carpet	7	ponder	6	
7	petty	2	prolong	3	

Winning entries were submitted by the following readers: Bill Berry, Tucker, Ga.; John Bettini, Omaha, Nebr.; Ron Black, Dallas, Tex.; Steven S. Cobb, Louisville, Ky.; Joe Czyzyk Jr.,

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HARDWARE

BROTHER HR-15XL

Q. I own a Brother HR-15XL printer and want to use all of *Symphony*'s special print attributes. Please tell me which printer driver to choose during the Install program to accomplish this.

A. E. Small
Evansville, Ind.

A. Find out if your Brother HR-15XL emulates a Brother Twinwriter 5 or some other printer listed in the Install program. If it does, select that printer driver. The Unlisted driver should let you print some attributes.

If any other reader is using a Brother HR-15XL successfully with *Symphony*, please let us know which printer driver you selected.

WANG MATRIX PRINTER WON'T PRINT COLOR GRAPH

Q. I use *1-2-3* Release 2.01 on a Wang Professional Computer with a graphics card, and a Wang DM 50/300 Matrix printer with the optional Wang Color Option Kit.

I assigned the A range as the set of values for the pie wedges. I used the B range to indicate color and exploding codes for the pie wedges. I can print the pie wedges with different shading, but how can I print each pie wedge in a different color?

Nancy H. Lossee
Cytology Screening
Albany, N.Y.

A. Lotus Development Corp. doesn't list the Wang DM 50/300 Matrix printer as a Lotus-compatible peripheral. If you selected a printer driver that isn't for a color printer but works with your printer, the graph won't print in color. Check with Wang Laboratories to see if a driver exists for the Wang DM 50/300 Matrix printer using the Wang Color Option Kit. If a driver doesn't exist specifically for your printer, ask if your printer emulates another printer for which a driver exists.

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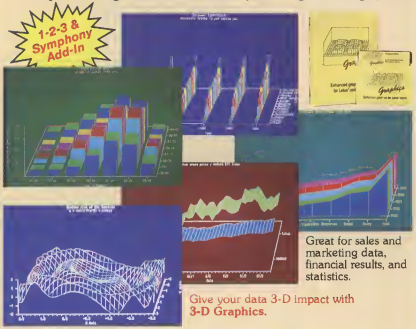

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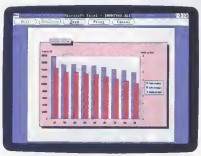

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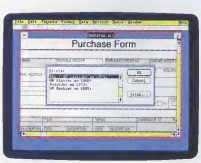

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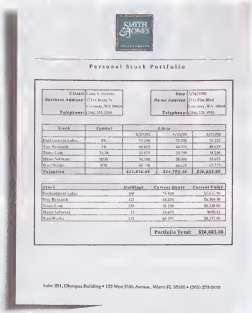

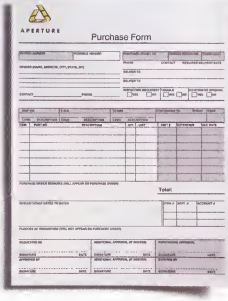

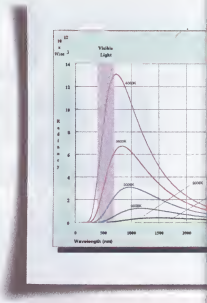

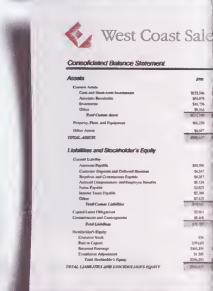

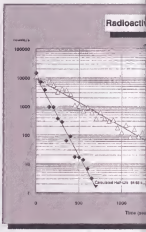

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MORE TIPS ON USING LOTUS PRODUCTS

SYMPHONY

AUTOMATICALLY PRINTING CONSECUTIVE FILES

How do you print several *Symphony* Release 1.1 or 1.2 files continuously without supervising your computer? Write a simple macro and save it in the macro library.

Create a table of files at cell A1 using the {SERVICES} File Table command. Use the {MENU} Erase command to erase the table entries in columns B and C. Then in cell B1 type the following:

+"{SERVICES}FR"&a1&"~
{SERVICES}PAGPQ"

Copy the formula all the way to the end of your file table. Enter *p* in cell C1. Select MENU Range Name Labels Left and enter *c1*. Now your macro has a range name. Your worksheet should look something like the screen below.

Press SERVICES Application Attach and select the file MACROMGR.APP. Now press Invoke, select MACROMGR Save to save your macro in the library in memory and on the disk. Give a name to the macro library; indicate the range that includes the file names, their respective macros, and the name of the macros, (*p*). Select either No or Yes indicating whether to lock your macro library with a password.

Now turn on your printer, hold down the MACRO key (Alt on most computers), and press P to start the macros.

As an option, you can select MENU Range Values to change the formulas in column B to values. Then you can just save the macros themselves without column A.

In the future, you must attach the MACROMGR application, invoke it, and load the library file containing your macros before using them.

Myrna U. Gonzalez
Houston, Tex.

	A	B	C
1	APPEND_A.WR1	{SERVICES}FRAPPEND_A.WR1~{SERVICES}PAGPQ	\p
2	APPEND_B.WR1	{SERVICES}FRAPPEND_B.WR1~{SERVICES}PAGPQ	
3	APPEND_C.WR1	{SERVICES}FRAPPEND_C.WR1~{SERVICES}PAGPQ	
4	APPEND_D.WR1	{SERVICES}FRAPPEND_D.WR1~{SERVICES}PAGPQ	
5	APPEND_E.WR1	{SERVICES}FRAPPEND_E.WR1~{SERVICES}PAGPQ	

USING SYMPHONY PRINT ATTRIBUTES IN SHEET

I recently found a way to use *Symphony*'s print attributes in the SHEET environment without causing the cell's contents with the attribute to shift to the left. Insert a column on each side of the Print range and enter the begin-attribute character in each cell of the new far-left column. Then enter the end-attribute character in each cell of the new far-right column.

In the example in the next column, the original Print range is A1..C8. Insert a column with the cell pointer on column A. With the cell pointer in cell A1, hold down the Control key and press B, then press Return to enter the begin-attribute character. Copy cell A1 to range A2..A8. Similarly, in cell E1, enter the end-attribute character by pressing Control-E, then copy cell E1 to range E2..E8. Edit cell A7 by appending the letter U to the begin-attribute character. Row 7 will be printed underlined. Then append the number 1 to the character in cell A8. Row 8 will be printed bold-faced and underlined.

	A	B	C	D
1			Dates	
2		9/30		12/31
3				
4	Assets			
5	Cash		$100.00	$110.00
6	Bonds		$120.00	$130.00
7	Stocks		$300.00	$310.00
8	TOTAL		$520.00	$550.00

To activate the print attributes, you must include the new columns A and E in your Print range. If you wish to print the same range without the print attributes, exclude these two columns from the Print range.

Douglas W. Phillips
Williams College
Williamstown, Mass.

PRINT ATTRIBUTES IN DATABASE REPORTS

I happened upon an undocumented use of *Symphony*'s print attributes while creating a database. If you generate a *Symphony* database using the print attributes such as boldface, underline, or italics as part of the field names, they will print with these attributes.

For example, enter the following in a new SHEET window. To create the ▲, hold down the Control key and press B (for "Begin attribute"). Then type *uName:L:20* and press Return. Move the cell pointer down one cell and enter *Address:L:15*. Then move the cell pointer down one cell and type *State*, hold down the Control key, press B to create the ▲ and type *i:L:2*. Press Return.

▲uName:L:20
Address:L:15
State▲i:L:2

Now generate the entry form, and enter your data records in the database.

When you print your report, the field headings will be printed underlined, and the records will be printed in italics, as in the sample report below:

Name	Address	State
John Kay	*2 Rose St.*	*Mass.*

Sara Fletcher
Columbus, Ohio

Be aware that the attribute code becomes a permanent part of the field name. When you write formulas in customized Report ranges, you must include the attribute code as part of the field name. For example, the reference to the Name *field in a formula would be +▲uNAME. Also, the alignment of the database records under the field names will be off by two characters because of the two-character attribute in the field name.*

1-2-3

HERCULES DRIVERS AND WORKSHEET TITLES

I needed to keep row and column titles on the screen while I scrolled through long rows and columns of data. I set worksheet titles in a *1-2-3* Release 2.01 worksheet using the Hercules 90 x 38 display driver. I tried to retrieve the same file using the Hercules 80 x 25 driver. The computer crashed, ASCII graphic characters scrolled on the screen, and the cell pointer appeared in the titles area.

To fix this problem, I used the 90 x 38 driver and removed the titles from the worksheet. I could then retrieve the worksheet using the Hercules 80 x 25 display driver.

Ray Hutton
Somerville, N.J.

RANGE JUSTIFY TIPS

The following tips help you get the most out of *1-2-3*'s Range Justify command.

1. Enter one sentence per cell when typing paragraphs.
2. Type two blank spaces after the period that ends each sentence.
3. Enter the entire paragraph before using the Range Justify command.
4. Insert a "hard space" between words that you don't want to become separated at the end of a line. To do this, hold down the Alt key, press the F1 key, then press the Spacebar twice. The dot that appears on the screen will appear as a blank space on the printed document. When you choose Range Justify, the words on either side of the dot will be held together as though they were one word.
5. Use the following macro when you need to justify a range of text:

```
      A        B        C
1  /RJ
2  {END}{D 2}{R 6}~
```

/RJ Presses slash and selects Range Justify.

{END}{D 2}{R 6}~ Selects the entire paragraph, moves the cell pointer down one row, and extends the range six more columns to the right. In *1-2-3* Release 1A, you must change {D 2} to {DOWN}{DOWN} and {R 6} to {RIGHT}{RIGHT}{RIGHT}{RIGHT}{RIGHT}{RIGHT}. This gives you 63 characters across, with the default column width of 9.

With the cell pointer on cell A1, press slash, select Range Name Create, enter \r, and press Return. Place the cell pointer on the first line of the text that you want to justify. Start the macro by holding down the MACRO key (Alt on most computers) and pressing R. If the computer beeps and you get the error message *Justify range is full* or *Line too long*, press the Escape key and *1-2-3* will display the justification it was able to complete. The error message indicates that you selected Range Justify without specifying a range that is large enough for the text you want to justify. If you rejustify the range, be sure to specify a larger range for the text.

Ron J. Low
Sara Lee Bakery Co.
Deerfield, Ill.

1-2-3/SYMPHONY

DOS 3.3 BACKUP COMMAND

PC-DOS Version 3.2 and earlier versions let you use the DIR command to search for individual file names on each of the disks that contain files created by the BACKUP command. However, the PC-DOS 3.3 BACKUP command stores these files by creating only two files on the target disk. BACKUP.XXX contains the actual files that are compressed together, and CONTROL.XXX contains a record of how the files are stored within BACKUP.XXX. This backup method saves disk space, but it doesn't let you browse or search for a file in the conventional manner using the DIR command.

To work around this difference of DOS 3.3, you can use the /L option with the BACKUP command. For example, at the DOS prompt enter:

BACKUP C:\data a:/s/l

The /s option backs up all files, as well as subdirectory files, in a subdirectory called DATA. The /l option stores a file called BACKUP.LOG in the root directory of drive C. This file contains information on the date and time of the backups, the disk number of the backed-up files, and the path and file name of each of these files. You can use the DOS TYPE command to browse through the actual files.

James D. Nantz
University of Northern Iowa
Cedar Falls, Iowa

CHANGING THE CURRENCY FORMAT

I have always designed my financial reports to have a blank space between the dollar sign and the number. However, when I started using *1-2-3*, I found that I couldn't adjust the currency format and retain the numeric value in the cell. I have found a way around this inconvenience.

To change the currency format, select /Worksheet Global Default Other International Currency and press the Spacebar to add a space after the dollar sign. Press Return, then select Prefix Quit Update Quit to save this change in the configuration file. When you enter a number in the spreadsheet and assign the Currency format to it, the dollar sign will be displayed, followed by a blank space and the number. You may need to set wider column widths to accommodate the additional space.

Alton Prewitt
Tenneco Realty
Houston, Tex.

You cannot change the display of the currency sign in 1-2-3 *Release 1A. To change the display of the currency sign*

in Symphony, *select SERVICES Configuration Other International Currency and press the Spacebar once after the dollar sign. Then press Return and select Prefix Quit Update Quit to save this change to the configuration file.*

PREVENT DATA LABELS FROM OVERWRITING GRAPH BORDERS

When I graph our monthly financial results, line-graph and bar-graph data labels overwrite the borders and titles that are at the top of the graph. I have created a formula that prevents this problem because it determines the maximum number that is in the data range and increases that number by 25%.

First select /Graph Options Scale Y-Scale Manual. Then select Upper and enter the following formula in which *range* refers to the range of data used in the graph:

@MAX(range)*1.25

Charlie Meilach
Livingston Distribution Centres
Etobicoke, Ontario

In Symphony, *you can use the same formula to set the upper limit of the Y-Scale. Select MENU Graph 2nd-Settings Y-Scale Type Manual-Linear, press Return, and enter the formula.*

COPYING A FORMULA DOWN A COLUMN OR ACROSS A ROW

I've found a useful technique for copying a formula so that it is repeated down a column or across a row.

To copy a formula down a column, place the cell pointer two cells below the cell you want to copy from and select /Worksheet Window Horizontal (in *Symphony*, SERVICES Window Pane Horizontal-Split). Move the cell pointer to the lower window by pressing the WINDOW key and position it on the last cell of the range to which you want to copy the formula. Press the WINDOW key again to position the cursor in the upper window, then place the cell pointer on the cell to be copied. Select /Copy (in *Symphony*, MENU Copy) and press Return, then move the cursor down one cell and press period to anchor the highlighted range. Press the WINDOW key again, then press Return. The formula is copied down the entire range. When you press the WINDOW key while highlighting a range, the highlighted area expands from its anchored corner to the current cell of the second window.

H. Sigal
Union Carbide Corp
Danbury, Conn

Select /Worksheet Window Clear to clear the window. In Symphony *select SERVICES Window Delete and specify the lower window. Then select SERVICES Window Layout, press End DownArrow Return, and select Quit. Your method helps you copy to several large ranges in succession, but it's extra work if you're performing only one copy operation. To copy a formula across a row, place the cell pointer two cells to the right of the cell you want to copy from and select /Worksheet Window Vertical (in* Symphony, *SERVICES Window Pane Vertical-Split).*

HARDWARE

PRINTING IN BOLDFACE WITH THE HP 2934A

I have an HP 2934A printer, and I was told it would work with *1-2-3* if I used the driver for the HP ThinkJet Model 2225 printer. However, I couldn't make the printer print in boldface. I learned that to get boldfaced print with the HP 2934A, I need to get a font cartridge that prints in boldface. The ThinkJet prints in boldface without a cartridge because it has a built-in boldface font, whereas the HP 2934A does not.

B. Ann Nanos
Los Angeles, Calif.

According to Hewlett-Packard, you can't buy a boldface-print cartridge for the HP 2934A printer.

NEC 8023 PRINTER DIP-SWITCH SETTINGS

Incorrect DIP-switch settings can result in striated printed graphs. Here are the correct DIP-switch settings for the NEC 8023 printer:

	1	2	3	4
SWITCH-BLOCK 1	ON	OFF	ON	OFF
SWITCH-BLOCK 2	ON	OFF	ON	OFF

	5	6	7	8
SWITCH-BLOCK 1	ON	OFF	ON	OFF
SWITCH-BLOCK 2	ON	OFF	ON	OFF

Michael McCarthy
Boston, Mass

BURNING IN NEW COMPUTER EQUIPMENT

It's likely that if a new piece of computer equipment is going to fail, it will do so early in its operating life. A good practice to ensure future reliability is to leave new equipment turned on for the first several days. During this burning-in period, use the equipment occasionally to see if it's still functioning properly.

If your system does fail soon after purchase, you can return it to the dealer for immediate replacement rather than send it to a service center or back to the manufacturer.

Joseph R. Charnetski
Plains, Pa

Several major computer-equipment manufacturers report that they burn in their own products before shipping. Dealers often run the equipment for an additional 24 to 36 hours to ensure proper functioning and thereby decrease returns. However, it is good practice to do your own burn-in for 24, 48, or more hours and confirm that the equipment works properly.

USING HP LASERJET SERIES II PRINTER RESET CODE

I share an HP LaserJet Series II printer with a coworker. Each of us uses different fonts and setup strings. If either of us uses a program that doesn't send a printer setup string, our output might be printed using the font and orientation that were last used, rather than using the font and orientation specified by the current program's default settings.

We've overcome this problem by selecting /Worksheet Global Default Printer Setup and entering the setup string \027E. We then select Quit Update Quit. Each spreadsheet uses this

reset code as a global default, and any additional setup strings that we add at the Print menu (/Print Printer Options Setup) follow the setup string \027E. We also embed the page-eject setup string, \012, in the last row of the first column of the print range. In the same cell, we add the reset code \027E. At the end of every printed range, the printer resets all settings to the default settings.

Rilene Simpson
Westinghouse Electric Corp.
Bridgeville, Pa

DETERMINING PAGE AND MARGIN SETTINGS

I use an Epson printer with 8½-by-11-inch paper and a formula to help set top and bottom margins when I change the number of lines I want to print on a sheet of paper.

For an 8½-by-11-inch page, the total page length is 66 lines. *1-2-3* automatically leaves 3 lines each for headers and footers (1 header or footer line and 2 blank lines). Given that the default top and bottom margins are each 2 lines, you can expect 56 lines per printed page. I use the following formula when I change the page length:

Top margin + bottom margin =
60 − # of lines per sheet of paper

If I want to have 30 lines to a page including the header and footer, I have 30 lines left to divide between top and bottom margins. This formula is a big help when I build models whose ever-changing dimensions prohibit inserting fixed page breaks in the sheet.

Lynn Wilson
Ripley, Ohio

The page-length setting is usually dependent on the printer you're using. The above equation or formula will work fine for most dot-matrix printers. If you're using an HP LaserJet, the suggested page-length setting is 60 lines rather than 66. After subtracting the 6 lines for header and footer, you're left with 54 lines to use in your equation.

SYMPHONY 2.0 AND VIDEO AND MEMORY ADAPTERS

I have an AST Rampage expanded-memory adapter in my computer. When I use the AST REMM.SYS expanded-memory manager software and try to gain access to any settings sheet in *Symphony* Release 2.0, I get a partially blank screen or a screen that displays indecipherable characters. The problem arose from the way I set up the AST REMM.SYS command in my DOS CONFIG.SYS file. I used the following command:

device=(path)\remm.sys

According to AST Research, to run an IBM Enhanced Graphics Adapter monitor, I need to add the following parameters to the end of my command line (see the first command below), and to run an IBM Video Graphics Array, I need to add a different set of parameters (see the second command):

/X=A000−BFFF /X=E000−EFFF

/X=A000−C7FF /X=E000−EFFF

In any case, without these parameters there is a conflict between the video adapter and the expanded-memory adapter.

Jenna Black
Los Angeles, Calif.

REVISITED

MULTIPLE BACKUP COPIES

"Editing File Names, Addendum" [Good Ideas, May] gave me an idea for keeping several backup versions of a file that I update frequently. I created a batch file that saves one copy of each of the previous two versions of a file and one copy of the latest version.

Create the batch file in DOS by entering the following lines. Replace *datadir* with the path name of your data-file directory.

```
copy con c.bat
cd \datadir
copy listb.wk1 listc.wk1
copy lista.wk1 listb.wk1
copy list.wk1 lista.wk1
exit
^Z
```

To create the ^Z characters, hold down the Control key and press Z (or press the F6 key on most computers), then press Return. After you make changes and save the file LIST.WK1, select /System and run this batch file by entering *C* at the DOS prompt. It will automatically save the last two versions of the file and make a backup copy of the present version. The batch file will produce the error message *File not found* when you first run it, but ignore this message; it will cease by the third run.

Lee A. Oliver
Procter & Gamble Co.
Cincinnati, Ohio

The batch file must reside in the same directory as your 1-2-3 program files.

KEYBOARD LOCKUP

I have made the mistake of holding down the Shift key and pressing the PrintScreen key accidentally [Hardware Hints, February]. If I do this without a printer attached to the computer, the keyboard locks up. However, if I wait, the computer eventually clears the buffer and unlocks the keyboard. This effortless technique works on several computers, including an AMQ portable and the IBM PC XT and PC AT.

When I accidentally press PrintScreen, the computer takes about one minute before it frees the keyboard. I usually press the Home key and then the LeftArrow key so that when the keyboard unlocks, the computer will beep, letting me know that I can continue to work.

John P. de Koff
Penn Yan, N.Y.

CREATE A THIRD WINDOW

I would like to add to the technique that Thomas Turner submitted in June to show how to create as many as three windows in *1-2-3*. You can select /Worksheet Titles Horizontal in each of the two horizontal windows to create a maximum of four windows. You'll have two movable and two fixed windows to view a large worksheet more easily.

C. Scott Clay
Coatesville, Pa

This material is prepared by Subhadra Mattai and the Technical Editors, with the help of the Lotus Product Support staff.

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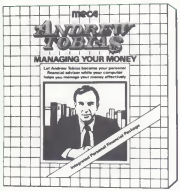

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reset code as a global default, and any additional setup strings that we add at the Print menu (/Print Printer Options Setup) follow the setup string \027E. We also embed the page-eject setup string, \012, in the last row of the first column of the print range. In the same cell, we add the reset code \027E. At the end of every printed range, the printer resets all settings to the default settings.

Rilene Simpson
Westinghouse Electric Corp.
Bridgeville, Pa

DETERMINING PAGE AND MARGIN SETTINGS

I use an Epson printer with 8½-by-11-inch paper and a formula to help set top and bottom margins when I change the number of lines I want to print on a sheet of paper.

For an 8½-by-11-inch page, the total page length is 66 lines. *1-2-3* automatically leaves 3 lines each for headers and footers (1 header or footer line and 2 blank lines). Given that the default top and bottom margins are each 2 lines, you can expect 56 lines per printed page. I use the following formula when I change the page length:

Top margin + bottom margin =
60 − # of lines per sheet of paper

If I want to have 30 lines to a page including the header and footer, I have 30 lines left to divide between top and bottom margins. This formula is a big help when I build m changing dimension fixed page breaks in

The page-length sett pendent on the pri The above equatior work fine for most a If you're using an H gested page-length rather than 66. Afte lines for header and with 54 lines to use

SYMPHONY 2.0 AND MEMORY

I have an AST Ra memory adapter When I use the AST ed-memory manage to gain access to any settings sheet in *Symphony* Release 2.0, I get a partially blank screen or a screen that displays indecipherable characters. The problem arose from the way I set up the AST REMM.SYS command in my DOS CONFIG.SYS file. I used the following command:

device=(path)\remm.sys

According to AST Research, to run an IBM Enhanced Graphics Adapter monitor, I need to add the following parameters to the end of my command line (see the first command below), and to run an IBM Video Graphics Array, I need to add a different set of parameters (see the second command):

/X=A000−BFFF /X=E000−EFFF

/X=A000−C7FF /X=E000−EFFF

In any case, without these parameters there is a conflict between the video adapter and the expanded-memory adapter.

Jenna Black
Los Angeles, Calif.

REVISITED

MULTIPLE BACKUP COPIES

"Editing File Names, Addendum" [Good Ideas, May] gave me an idea for keeping several backup versions of a file that I update frequently. I created a batch file that saves one copy the present version. The batch file will produce the error message *File not found* when you first run it, but ignore this message; it will cease by the third run.

Lee A. Oliver
Procter & Gamble Co.
Cincinnati, Ohio

The batch file must reside in the same directory as your 1-2-3 program files.

KEYBOARD LOCKUP

I have made the mistake of holding down the Shift key and pressing the PrintScreen key accidentally [Hardware Hints, February]. If I do this without a printer attached to the computer, the keyboard locks up. However, if I wait, the computer eventually clears the buffer and unlocks the keyboard. This effortless technique works on several computers, including an AMQ portable and the IBM PC XT and PC AT.

When I accidentally press PrintScreen, the computer takes about one minute before it frees the keyboard. I usually press the Home key and then the LeftArrow key so that when the keyboard unlocks, the computer will beep, letting me know that I can continue to work.

John P. de Koff
Penn Yan, NY

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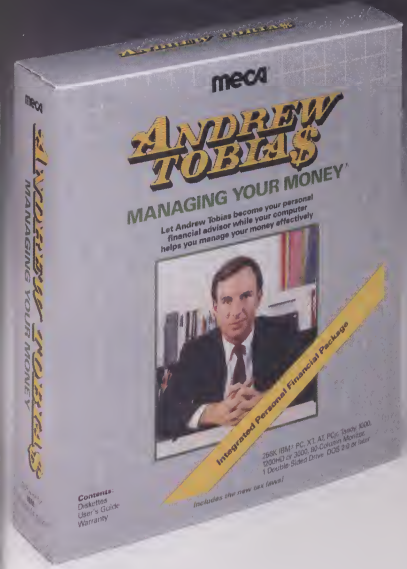

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HOT LINE TWO AND LOTUS EXPRESS

These two utilities make it easier to communicate.

BY MARC DAVIDSON

The most useful productivity tools sometimes turn up where you least expect to find them. Consider, for example, *Hot Line Two* and *Lotus Express*. Neither communications utility was designed with spreadsheets in mind, yet each can be an enormous help to *1-2-3* or *Symphony* users.

Hot Line Two helps you cut the time and cost of using your telephone. The program combines an automatic dialer, a phone log, and an on-line telephone directory.

Lotus Express helps you manage your electronic mail. It's designed for use with MCI Mail, one of the more popular public electronic-mail carriers. In addition to vastly simplifying the job of sending, receiving, and storing electronic mail, *Lotus Express* lets you send your worksheets and other data files via MCI Mail without first converting them to text files.

JEANNE OPPENHEIMER

THE ULTIMATE DIALER

Hot Line Two is a superset of the dialer program in Borland International's *SideKick*. Like *SideKick*, it is a terminate-and-stay-resident program. When you want to place a call, you press a predefined key to display either the program's main menu or one of your phone directories over whatever other program you were using. *Hot Line Two* will read a phone number from its phone directory and dial the call through your modem. It will also read a phone number from the screen, where that number may appear in a *1-2-3* database or in another program.

While *SideKick*'s dialer is a barebones automatic dialer, *Hot Line Two* offers a way to automate and customize every conceivable dialing situation. For example, if while on a trip to San Francisco you use *Hot Line Two* to make a call within the city's 415 area code and you've told *Hot Line Two* that's the area code you're now in, *Hot Line Two* will automatically ignore the area code prefix stored with the number. In other dialing programs, you'd have to edit the phone number manually.

Similarly, if you have a Centrex phone system, give *Hot Line Two* the first three digits of your company's phone system. The program will then recognize internal numbers and dial only their last four digits. When you're away from the office, change that setting and *Hot Line Two* will dial those numbers in their entirety.

The program lets you categorize your calls as local, toll, long-distance, international, internal, and miscellaneous and establish different procedures for each type of call. That makes it easy to use as many long-distance carriers as you wish.

Other features let you dial any of 30 numbers with three keystrokes, automatically redial calls, and dial phone numbers via your computer's numeric keypad.

A SIMPLE DATABASE PROGRAM

Hot Line Two has a database manager that comes with a national phone directory of major businesses and organizations, a directory of area codes, and a directory for determining the time of day at any location you want to call. The database manager lets you add and delete records from a directory and create your own phone directories.

Since the program stores its database files in *dBase III* file format, you can access directories stored in any *dBase III*–compatible file. You can also import a comma-delimited file containing a directory and export a directory file into a comma-delimited file.

To create a phone directory, you first define the file. *Hot Line Two* prescribes a list of 15 fields the file can contain—fields that include name, address,

Marc Davidson writes frequently for the Data Transfer column.

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	Oakland	Oct 6
	Sacramento	Nov 10
	San Diego	Oct 6, Nov 3, Dec 6
	San Francisco	Oct 11 Nov 9, Dec 15
	San Jose	Oct 20, Nov 17, Dec 15
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	Jacksonville	Oct 19
	Tampa	Dec 7
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	Bethesda *(Commercial)*	Dec 7
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    Find: type name, press <-/   Dial: press <-/   ↑ or ↓ to select
    More: PgDn/PgUp   Top/Bottom: Ctrl-PgUp/PgDn   Pattern search: F7
    Edit: F10   Append: F9   View: F2   Delete: F1   ESC when done

Eastern   Costs:      280    435    355    300
Western   Costs:      234    154    324    345
          Profit:     567    223    360    265
```

The *Hot Line Two* phone directory includes larger businesses and organizations from across the country. Shown here, highlighted and ready to dial, is Lotus Development Corp.'s phone number. Note the *1-2-3* worksheet partially hidden behind the pop-up window.

phone number, and time zone. A separate utility lets you change the preset field names. What this scheme costs you in flexibility you gain back in ease of use. You have only to choose which fields to include and specify the length of each. You don't need to know much about databases to set one up.

Since the program uses *dBase III*'s file format, you can read phone directories stored in *dBase III* files, provided those files meet certain limits. The most significant limit is that they contain no more than 1,000 characters per record.

The program will not read worksheet files stored on disk. However, it can read phone numbers directly from your screen. This means you'll have to retrieve that worksheet when you want to make a phone call, which could be inconvenient. So if you have a phone list in either *1-2-3* Release 2/2.01 or *Symphony*, it's easier to use the Lotus Translate utility to change the worksheet-based database into a *dBase III* file. Thereafter you can read it directly from disk with *Hot Line Two* and you won't have to retrieve another worksheet.

The database manager has some hidden bonuses. It can convert a phone list into a printed mailing list, export the list to a full-fledged database-management program, and keep logs of your phone calls.

Since your *Hot Line Two* directory file has ample room for mailing-list information, you might include that information and use *Hot Line Two* for both purposes. With *Hot Line Two*'s separate utility program, you can print mailing labels in several predefined formats. You can also design your own formats. The program will also let you print simple subsets of a directory, such as entries for a given state. For more-complex mailing-list work, you can export the data as a comma-delimited file and import it into *1-2-3* or *Symphony*, or you can use *dBase III* to work with your *Hot Line Two* files.

Hot Line Two can log each call. The log contains the phone number; date, time, and duration of the call; and name of the person called. The program also places a digital timer on your screen that lets you know how long you've been talking. If you primarily want a device that logs other people's phone usage, don't choose *Hot Line Two*. The feature is an option, so anyone can ignore it. Further, the user must press a key to both start and stop the timer.

The program stores the log in fixed-length-record format. Using the File Import Text command, you can import the log into a worksheet. You can then break the data into appropriate columns by selecting /Data Parse in *1-2-3* Release 2/2.01 (in *Symphony*, MENU Query Parse). Release 1A provides no simple way to do that.

If you bill clients for time spent on the phone, you can sort the list by name and total the length of calls for each. If you bill phone expenses, you can enter the amounts from your phone bill before sorting and totaling. If you don't bill time or phone calls but want to know where your time goes, the log can help you figure it out.

MAIL MANAGEMENT

With MCI Mail alone, you can send text files to another person's electronic mailbox, but you can't send or receive nontext files, such as worksheet files. Instead, MCI Mail sends the data as lines of text, eliminating the distinction between columns and omitting anything that doesn't appear on screen, such as underlying formulas.

Lotus Express solves this problem by letting you piggyback worksheet files, word-processing files, and other binary files. You simply create and save the file as usual, and then use *Express* to attach it to a message written with the program's text editor. The recipient, however, must be using *Express* in order to receive the attached file.

MCI Mail's Basic Service is menu-driven. Because there are many ins and outs to using MCI Mail, you must know how to operate it and how to use your communications program. *Express* acts as an intermediary between you and MCI Mail to make MCI Mail easier to use. With *Express*, you specify what you want sent, and the program handles the entire process. It dials the call, sends the data, checks your MCI mailbox, downloads anything it finds, and hangs up when it's done. If you received a message, the program will beep, and you'll see a brief entry when you next display *Express*'s message summary screen.

Like *Hot Line Two*, *Lotus Express* operates in the background. It automatically calls up MCI at intervals you prescribe, and memory permitting, you can run another application on your computer while *Express* does its work.

OTHER CONSIDERATIONS

Because communications programs depend on modems, either of these programs may have problems working with a digital PBX. In general, you can't use a modem on a digital PBX because such a PBX uses proprietary signals, whereas most modems use the standard public-network signals. If your modem works on your PBX with other communications programs and if it is Hayes-compatible, it should work with either of these programs. If your modem doesn't work on a voice line on your PBX, contact the head of telephone services and ask for a data line.

Since both *Lotus Express* and *Hot Line Two* reside in RAM while you use other applications, the amount of memory each uses detracts from what's available to other applications. The less memory the background program needs, the better. *Hot Line Two* scores well on that account, using between 72K and 85K of RAM, depending on the kind of monitor you have.

If you install an expanded-memory board, *Hot Line Two* will use less than 3K of conventional memory, loading

the remainder of the program into expanded memory. Since portions of *1-2-3* Release 2/2.01 and *Symphony* 1.1, 1.2, and 2.0 worksheets can also reside in expanded memory, that may seem insignificant. However, these programs don't use expanded memory as effectively as they use conventional memory, so the more conventional memory available to them, the better.

Express uses anywhere from 93K up to the entire amount of conventional memory available, depending on how you configure it. If you select too little memory, *Express* will truncate messages that are too long to fit. For most messages, 280K suffices, but 280K is a lot of memory for a background program to occupy, and none of that memory can come from expanded memory.

Because of that liability, it's particularly important that the program contain commands that let you unload it from memory after you send and retrieve your mail. That is the most practical way to use it under most circumstances. An alternative is to spend another $35 on *Lotus Metro* 1.1, which Lotus Development Corp. claims will significantly reduce *Express*'s memory requirement. However, if you typically use small worksheets, and if you have 640K of conventional memory and an expanded-memory board, there's nothing to prevent you from using *Express*, *Hot Line Two*, and *1-2-3* simultaneously. ■

IN BRIEF

Hot Line Two. General Information Inc., 401 Parkplace, Suite 305, Kirkland, WA 98033; 206-828-4777. Runs on the IBM PC, PC AT, PC XT, PS/2, and 100%-compatible computers. Requires 256K of RAM, DOS 2.0 or higher, and a Hayes-compatible modem. Released 11/87. $99. Not copy-protected; 30-day, money-back guarantee.

Lotus Express Release 1. Lotus Development Corp., 55 Cambridge Pkwy., Cambridge, MA 02142; 800-345-1043; or MCI Mail 1150 17th St. NW, Suite 800, Washington, DC 20036; 800-444-6245. The 5¼-inch version runs on the IBM PC, PC XT, PC AT, Compaq, AT&T 6300, and 100%-compatible computers. The 3½-inch version runs on the IBM PS/2 series, IBM Convertible, and Toshiba 3100 computers. Requires 256K of RAM for DOS 2.0 or 2.1 (320K for DOS 3.0 or higher), a serial port, a Hayes or true Hayes-compatible modem, and two floppy-disk drives (a hard disk is recommended). Released 12/86. $150. Copy-protected; 90-day disk warranty.

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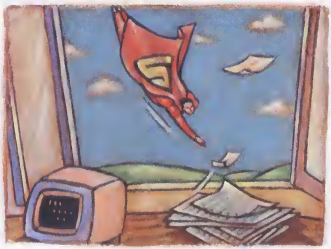
SOFTWARE: BOOKMARK, MAXI*SAVE, AND SOS

Three programs that save your worksheet, even if you don't

BY MARC DAVIDSON

There's a damning finality about the command Quit Yes. In *1-2-3*, if you don't save your worksheet before making that selection, you lose your data for good—that is, unless you use *Bookmark*, *Maxi*Save*, or *SOS* (*Save Our Spreadsheet*), three programs that automatically save your worksheet.



Each of these programs works with *1-2-3* Releases 1A, 2, and 2.01. *SOS* and *Bookmark* also work with *Symphony*. All of the programs can save your worksheet either after a specified period of time or after you've pressed a given number of keys. Beyond that, the programs have little in common. Which program you choose depends on your work style and budget.

If you need a program that does nothing but save your worksheets, get *Maxi*Save*. This *1-2-3* add-in is both the simplest and the least expensive of this group. If you save files infrequently, don't have a hard disk, and want inexpensive protection against losing an unsaved file because of a power failure, consider *SOS*. If you have a hard disk, for a little more money, you can get *Bookmark*, which provides the best protection against losing files due to power failures.

THE BASIC SOLUTION

By default, *Maxi*Save* stores your worksheet every five minutes or every 500 keystrokes, whichever occurs first. The program detects keystrokes that select potentially dangerous commands and saves the worksheet before letting *1-2-3* act on those keystrokes. Among these intercepted commands are those that combine files, erase worksheets, and insert or delete columns and rows.

Of course, you can't work on your worksheet while *Maxi*Save* is saving it. Thus, the program is designed not to interrupt you while you are entering something into the worksheet. If you've reached the 500-keystroke or five-minute limit but have not completed an entry or a series of commands, *Maxi*Save* waits until the worksheet is in Ready mode before it saves the file.

Since the delay that accompanies saving a file may still come at an inconvenient time, you can have the program prompt you to save your file instead of having it save the file automatically. Upon seeing a prompt, you can choose either to save the file or to wait until your work reaches a logical break. If you continue working and forget to save the file, the program reminds you again in another five minutes or another 500 keystrokes.

Most other features in *Maxi*Save* enhance the save function. The program saves the worksheet under its original file name, so if you haven't yet named the file, *Maxi*Save* prompts you to do so. If you don't respond, the program assigns a file name. It will avoid any extant file names in order to prevent overwriting a file that has the same name.

*Maxi*Save* has some drawbacks worth considering. It uses a lot of RAM—86K, as opposed to a mere 10K for the more powerful *Bookmark*. Also, its documentation is skimpy, and its approach to saving files and to undoing the changes you have made to them may hamstring you.

The program always saves the file under the name you originally assigned to it. If you decide to make experimental changes and you manually save the file under its existing name, hoping to later retrieve this version without the experimental changes, you'll be rudely surprised. *Maxi*Save* regularly overwrites the file with the most recent version, in effect making your experimental changes permanent. To avoid this, you must manually save the file under a new name before making the experimental changes. Then immediately save the file again under the original name.

*Maxi*Save* has an Undo command, but you have no way to control what changes it will or won't undo. It retrieves the last version of the file, and in doing so it cancels all the changes you made subsequent to saving that version. This former version may be several minutes and many operations behind the version currently on your screen. Thus, be forewarned that if you select

Marc Davidson is a frequent contributor to these pages.

JANE OPPENHEIMER

Undo in order to reverse a change you've just made, you'll probably reverse quite a bit more. Unfortunately, if that happens to you, there's no way to restore the worksheet to the way it was before you selected Undo. The program's publisher plans to fix these problems in Version 2, which is scheduled for release this month.

SAVE THAT SPREADSHEET

The telling difference between *SOS* and *Maxi*Save* lies in the programs' saving strategy. While *Maxi*Save* entirely assumes the job of saving your worksheet, *SOS* provides a different kind of assistance. It protects your files in the event of a power failure. As you work, *SOS* automatically saves your file. If the power goes out, you can later restart your computer and retrieve the file that *SOS* saved. However, *SOS* uses only one file name, no matter which worksheet you're working on. This means that the file *SOS* saves exists only until you retrieve another worksheet and *SOS* begins saving that one. Unlike when you use *Maxi*Save,* it's important that you also save the worksheet.

BOOKMARK, THE MOST AMBITIOUS OF THE THREE PROGRAMS, IS THE ONLY ONE THAT WORKS WITH SOFTWARE OTHER THAN SPREADSHEETS.

At your option, *SOS* can change saving strategies to store successive versions of the current worksheet in sequentially numbered files. That's useful when you develop new worksheets. If you make an error while you are working, you can retrieve one of the numbered files that was saved earlier in the work session.

SOS differs from *Maxi*Save* in some less significant ways too. You can have the program save files either after a certain length of time or after you've entered a certain number of keystrokes. However, unlike *Maxi*Save, SOS* can't automatically respond to whichever milestone occurs first. *SOS* also works with several other spreadsheet programs, including *Symphony,* whereas *Maxi*Save* works only with *1-2-3.*

SOS has two other pluses. First, the program uses a sparse 13.5K of memory. Second, it comes with a separate utility, Mayday, that helps you recover damaged worksheets, including those damaged so badly that you can't retrieve them. According to its publisher, Mayday attempts to rebuild the worksheet completely and lists in an ASCII file the cells that it can't recover.

SOS has one disturbing problem: If you remove it from memory while you are still in *1-2-3,* you may lose the very data you're trying to protect. On one occasion, after removing *SOS* from memory and selecting the File Save command, my computer locked up. On another such occasion, although *1-2-3* appeared to be saving the file, it stored nothing on the disk.

FAIL SAFE

Bookmark, the most ambitious of the three programs, is the only one that works with software other than spreadsheets. It is also the only program that does not save files in the Lotus worksheet file format. Instead, it saves everything that resides in RAM—data *and* programs—in a single large file that only *Bookmark* can read. For instance, if you are running *1-2-3* with *SideKick* (Borland International, Scotts Valley, Calif.) in the background and you're working on both a worksheet and a *SideKick* note file when *Bookmark* saves, it will save *1-2-3,* the worksheet file, *SideKick,* and the note file.

If your computer loses power and you have to restart it, *Bookmark* automatically reloads your programs and your data into RAM. If *Bookmark* was set at its initial default settings when your computer lost power, the program will restore your work to within five minutes or 2,000 keystrokes of where you were when the power failed. You can increase or decrease the default settings, or you can set the program to save only by the number of keystrokes or only by time increments.

If you're interested primarily in protection against power failures, *Bookmark* is preferable to *Maxi*Save* or *SOS.* If a power failure occurs while *Maxi*Save* or *SOS* saves a file, portions of the file will be lost and any remaining data may be rendered useless. To avoid this problem, *Bookmark* alternates its save operation between two different files. If one copy is damaged, *Bookmark* automatically restores your work from the intact backup file.

Bookmark's primary drawback is its inability to recognize any memory above 640K. If you use an expanded-memory board, *Bookmark* can't save the data that *1-2-3* stores in that type of RAM. According to the vendor, a new and more expensive version, *Bookmark Plus,* can. In contrast, both *Maxi*Save* and *SOS* can save data stored in expanded memory.

Bookmark's other notable features include password protection for your backup files, a range of customization options, and fast operation. In 10.5 seconds *Bookmark* saved both a worksheet file that required 100K of RAM and *1-2-3.* The time this operation took compares favorably with the 16.6 seconds *Maxi*Save* took to save only the worksheet file.

Bookmark is only slightly more expensive than *SOS,* but it does require a hard disk. Thus, if you want a general-purpose file-backup program that runs on a hard disk and you're not using expanded memory, *Bookmark* is easily worth its price. ■

IN BRIEF

Bookmark Version 1.2. Intellisoft International, 51 Digital Dr., P.O. Box 5055, Novato, CA 94948; 415-883-1188. Requires DOS 2.1 or higher, a hard disk, and 256K of RAM. Also requires a monitor equipped with an IBM Monochrome Display Adapter, CGA, VGA, or EGA, or a Hercules Graphics Card. Released 6/88. $99.95 ($179.95 for *Bookmark Plus*). Not copy-protected; six-month disk-replacement warranty.

*Maxi*Save* Version 1.11. The Maze Computer Group, Box 515, Lenox Hill Station, New York, NY 10021; 718-706-8377. Occupies 86K of RAM and requires *1-2-3* Release 1A, 2, or 2.01. Runs on any hardware and any version of DOS that *1-2-3* works with. Released 12/87. $69.95. Not copy-protected; 90-day disk-replacement warranty.

SOS Version 2.0. Goldata Computer Services, 2 Bryn Mawr Ave., Bryn Mawr, PA 19010; 800-432-3267. Occupies 13.5K of RAM and requires *1-2-3, Symphony, SuperCalc4, Framework, The Twin,* or *VP-Planner.* Runs on any hardware and any version of DOS with which these programs work. Released 2/88. $79.95. Not copy-protected; 30-day money-back and 90-day disk-replacement warranties.

This is for ev
too busy to get

If you're the type of person who's too busy to read an ad, read this ad.

Because you'll learn about a new tool that will help you manage people, ideas, projects, and information with incredible efficiency. A tool that will help you avoid slumping into your chair, shaking your head, and asking, "How on earth will I ever get this done?"

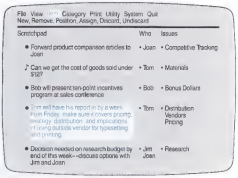
We call it Lotus® Agenda®, the personal information manager.

Agenda allows you to dump random facts, thoughts, and ideas into your PC without having to structure the information in advance.

Agenda's filing system is a more sophisticated version of this filing system. You can put items anywhere you want. View them any way you want. And have access to them anytime you want.

Dump any random, unrelated thoughts or ideas into Agenda, and it'll help you turn that information into a stream of structured, actionable knowledge.

You can record the thousands of tasks you need to address to put together a new product line. Or the thousands of factors you need to put together a new bottom line.



Items. Dump information in manually, import it or use our pop-up capability while in another program.

Agenda will not only file these random items of information for you, it'll help you arrange them any way you want.

So you can understand them better, formulate new ideas better and extract all the answers you need better.

Which means, now you can concentrate

eryone who's any work done.

File View Item Manage Print Utility System Quit
Column: Section, Management, Info

Issues	Product Ideas	Who	Department
• Packaging	● Accept packaging bids until the end of October	• Liz	• Operations
• Materials	✓ Make sure synthetic materials are reliable	• Sue	• Operations
• Research	● Have Tom break down market research results into best case/worst case scenarios.	• Tom	• Marketing
• Distribution Vendors Pricing	● Tom will have his report in by a week from Friday, make sure it covers pricing, strategy, distribution, and implications of using outside vendor for typesetting and printing	• Tom	• Marketing
• Distribution	✓ Do Tom and Bob think we need to adjust distribution mix?	• Tom Bob	• Marketing Sales

Categories. Agenda files items in all relevant categories so you can always find the information you need.

File C:\ AGENDA \ FILES \ ISSUES 06/21/88 11:00
Date Results by Priority

Issues	Joan	Priority	When
• Research	● Decision needed on research budget by end of this week—discuss options with Jim and Joan.	• High	• 06/25/88
• Competitive Tracking	● Forward product comparison articles to Joan	• Low	• 07/07/88
Issues	**Bob**	**Priority**	**When**
• Distribution	● Do Tom and Bob think we need to adjust distribution mix?	• High	• 06/22/88
• Bonus Dollars	● Bob will present ten-point incentive program at sales conference	• Medium	• 06/28/88

Views. Looking at the same information through different views gives you a more informed perspective.

more on using and acting on your information. And less on processing it.

How does Agenda work?

First, enter your items of information

The whole idea behind Agenda is to get them all in a row.

into your PC and assign them to categories that you create.

Then Agenda will do all of your filing automatically. And thanks to Agenda's *multiple filing capabilities*, if the information is relevant in more than one place, Agenda will take it and put it in several categories at once.

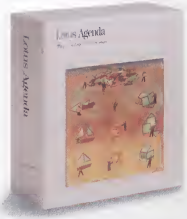
This makes it easy to view your data in different ways so you can pinpoint information that's important to you. Or discover new relationships you hadn't considered before. And anytime you change an item in a view, Agenda will automatically update all other categories where the item has been assigned.

In fact, you could say that Agenda recalculates your text the way a spreadsheet program recalculates numbers.

All of which means, from now on you'll be able to come in every morning, check your Agenda, and get right to work.

Because you'll immediately know what work needs getting to.

For $15, we'll send you an Agenda demo kit or videotape. Call **1-800-345-1043** and ask for demo kit AGQ-3058 for the 3.5″ version or AGQ-3053 for the 5.25″ version. Or ask for videotape AGQ-3063.



Introducing Lotus Agenda

Agenda and Agenda Demo Kit require an IBM® PC or compatible, with 640K and a hard disk, DOS 2.0 or higher. Lotus and Agenda are registered trademarks of Lotus Development Corporation. IBM is a registered trademark of IBM Corporation.

SOFTWARE: ORACLE FOR 1-2-3

An add-in database for those who use *Oracle*

BY WILLIAM LAWRENCE

If your company has a database on a mainframe or a minicomputer, moving information between *1-2-3* and that database can be tedious and time-consuming. If *Oracle* is your company's database program, *Oracle Database Add-in for Lotus 1-2-3* will probably solve those problems. *Oracle for 1-2-3* is an add-in that lets you create and access an *Oracle* database from within *1-2-3*, even if that database resides on another computer. You can retrieve data directly into your worksheet where you can analyze it and produce graphs and printed reports based on the data.

However, if your company doesn't use *Oracle* to store its central databases, *Oracle for 1-2-3* probably won't satisfy you. The add-in program has a powerful querying facility, but it has few of the other features you need if you plan to use it as a stand-alone database program. Compared with the database add-ins *Silverado* (Computer Associates International, San Jose, Calif.) and *4Views* (Turner Hall Publishing, Cupertino, Calif.), *Oracle for 1-2-3* offers little help in formatting reports, creating data-entry screens, or defining data-entry controls.

In sum, the program seems intended to simplify reaching *Oracle* databases from within *1-2-3*. It is not a full-function database management program.

You can use *Oracle for 1-2-3* to query *Oracle* databases that reside on other PCs, networked PCs, minicomputers, or mainframes. You can even create a single query that retrieves data from more than one computer. Any of these queries require the same commands that you would use to query an *Oracle* database that resides on your own hard disk. You do not need to log on to a mainframe because *Oracle* establishes communication between your PC and the database on the mainframe. Nor do you have to know the operating system commands of the host system. You will, however, need communications hardware, such as an Ethernet card and cabling, to connect the two computers.

If you need data that is stored in an *Oracle* database on a minicomputer or a mainframe, *Oracle for 1-2-3* can simplify and speed up the data-query process. For example, suppose you need to budget your department's salary expenses. From your company's personnel database, you need to retrieve a list of the department's employees and their salaries and job classifications so that you can analyze the information in *1-2-3*. You'd normally begin by requesting the list from your MIS (management information system) department, which would query the company database and create a data file on the mainframe. You would then log on to the mainframe from your PC and use a file-transfer program to move the data to your PC as an ASCII file. Finally, you'd use *1-2-3*'s File Import command to bring the file into a worksheet and *1-2-3*'s Data Parse command to divide the data and store it in separate cells. If your MIS department has no backlog of requests, the process should take a few hours. However, it's not uncommon for MIS departments to have large backlogs, and that could stretch your waiting time considerably.

With *Oracle for 1-2-3*, the entire process takes a few minutes, and you can undertake the query whenever you're ready. *Oracle for 1-2-3* lets you query the personnel database directly and retrieve the data into your worksheet. If you've obtained the security clearance to permit access to the personnel database, you can bypass the MIS department altogether.

ORACLE AND SQL

Oracle for 1-2-3 uses Structured Query Language (SQL), a command language that helps you manage databases because it simplifies complex queries. The program streamlines sorting and querying operations by letting you use menus and prompts to write SQL statements.

The menus provide an easy way to use a subset of SQL, but the program's manual doesn't clearly explain how to write your own SQL statements or how to modify existing ones. That's disappointing. Just as writing macros can extend the functionality of your worksheet, writing your own SQL statements can extend the functionality of *Oracle for 1-2-3*. Without clear explanations from the program's manual, you will have to rely on some other source for

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JENNIE OPPENHEIMER

```
A1: @SQL("SELECT * INTO A1 FROM labels WHERE (STATE =  ""CA"") ORDER BY COM STAT

INPUT:
    Tables:  LABELS
    Joins:   (none)
    Columns: *
    Groups:  (none)

OUTPUT:
    Range:   (A2..E20)

CRITERION:
    Column:  STATE                    Criterion: = "CA"

UNIQUE:      No

SORT:
    Key:     COMPANY                  Order: Ascending


Press any key to return to worksheet

Query Parameters List
10-May-88  05:00 AM                                          CAPS
```

To build a query with *Oracle for 1-2-3*, specify five items for creating a query statement (shown in the left column of the screen). The program translates these choices into a formula (shown across the top of the screen) and enters the formula in a cell on the worksheet.

learning how to write SQL statements.

Once you've created a query, you can store it in a worksheet cell and reuse it whenever you like. This technique lets you build a library of ready-to-go query statements. In addition to storing query statements in cells, you can embed them in macros and formulas, thereby extending the capabilities of *1-2-3*.

Once a query retrieves data, *Oracle for 1-2-3* stores it in a worksheet range where you can manipulate it as you would any other worksheet data. You can also move data from a worksheet range into an *Oracle* database. This smooth integration of data is the heart of *Oracle for 1-2-3*.

Unfortunately, integration isn't always enough. For example, although you can move data from the worksheet range into an *Oracle* database, you cannot bypass the worksheet and enter data directly into the *Oracle* database by using a data-entry form. To augment *1-2-3*'s meager data-entry facilities, you must create your own macros—a demanding job for anyone but an expert. Some sample data-entry macros come with *Oracle for 1-2-3*, but I don't recommend that you use them. I found them poorly written and hard to plumb.

Another drawback of *Oracle for 1-2-3* is that it consumes 271K of RAM, which would otherwise be available for the worksheet. Since you can transfer data from the worksheet and store it in an *Oracle* database file, you might deem this loss inconsequential. However, since *Oracle for 1-2-3* does little but query and sort, you'll have to do everything else, including printing reports, from inside *1-2-3*. That'll require space for your data, as well as for any macros needed to automate your work. Since *Oracle for 1-2-3* doesn't offer a way to automate the work you do with it, you'll be writing macros if you need to automate.

How much data will the worksheet store while you use *Oracle for 1-2-3*? With 640K of conventional RAM, 896K of extended memory, *1-2-3* Release 2.01, and DOS 3.1, *Oracle for 1-2-3* leaves just 145K of RAM for your worksheets. That's enough memory to store a 1,200-row list of names and addresses, with each entry in the list occupying five cells. Running *1-2-3* alone with 640K of RAM, you can store nearly four times as many entries, or about 4,500 names and addresses.

If that limitation bothers you but you still want to use an *Oracle* database to keep your files compatible with your company's files, you might consider *Professional Oracle*, which also runs on a personal computer. This program provides such features as a report generator, a programming language, and a data-entry screen generator when you use *Oracle* on a PC. However, since *Professional Oracle* is a stand-alone program, you lose the benefits of integration with *1-2-3*'s worksheet and graphics, and at $1,295 versus $199 for *Oracle for 1-2-3*, it's in an entirely different price category.

CAVEATS

In addition to the memory limitations and the substandard documentation of SQL, the program's installation process is seriously flawed. During installation, you are prompted to specify a name for a driver set that will be configured with *Oracle for 1-2-3*. If you select a name other than the default (123.SET), you are in for a surprise. The installation program will properly modify the driver set you specify. However, when you start *1-2-3*, it'll use the driver set named 123.SET, disregarding the SET file you specified earlier. The only solution is to insert the correct SET file name in the batch file yourself, and that may be beyond your ken. The documentation doesn't explain how to circumvent this problem by modifying the batch file with the DOS EDLIN program or by installing the add-in manually.

Oracle for 1-2-3 imposes demanding hardware, memory, and storage requirements. You need a PC with an 80286 or 80386 microprocessor (such as an IBM PC AT or a Compaq Deskpro 386), a minimum of 640K of conventional memory and 896K of extended memory, and at least 5 megabytes of free hard-disk space.

Although it runs under DOS, *Oracle for 1-2-3*, like OS/2 Extended Edition, uses more than 640K of memory (it uses what's called the protected mode of the microprocessor) to run its database operations. Theoretically, *Oracle for 1-2-3* uses more of the capability of the 80286 processor than DOS would normally allow, which leads you to expect a sparkling performance from *Oracle for 1-2-3*. The program can sort a 2,400-record name-and-address database almost three times faster than *1-2-3*. However, *Silverado*, which doesn't require extended memory, completed the same job in our tests even more quickly—almost four times faster than *1-2-3*.

If you need a full-featured database add-in, look elsewhere. If you do use *Oracle for 1-2-3* and you're not a DOS hotshot, get some help installing it. In addition, when you get set to use SQL, keep the publisher's phone number handy if you plan to branch out from the program's menus. ■

IN BRIEF

Oracle Database Add-in for Lotus 1-2-3 Version 1.0. Oracle Corp., 20 Davis Dr., Belmont, CA 94002; 800-672-2531. Runs on the IBM PC AT, PS/2 Models 50, 60, 70, and 80, and an 80286-based or 80386-based PC certified by Oracle, with DOS 3.0 or higher and *1-2-3* Release 2.01. Requires 640K of RAM, 896K of extended memory, and a hard disk with 5 megabytes of available space. Released 2/88. $199. 90-day free technical support and 90-day media warranty.

SOFTWARE: SPREADSHEET SHORTHAND

This program helps automate simple computer chores, but it has stiff competition.

BY JUDY HOUSMAN

You can alleviate one of the most serious bottlenecks in operating a computer—your typing—with *Spreadsheet Shorthand*. The program helps in two ways. First, you can create macros that automate lengthy or tricky operations. Second, you can abbreviate entries as you type and have *Spreadsheet Shorthand* immediately replace them with the full-length entries.

You can use *1-2-3* or *Symphony* macros to achieve similar results, but *Spreadsheet Shorthand* offers several advantages over either of the Lotus programs' macros. For example, it can automate operations, such as printing graphs, that you can't control with a Lotus macro. You can abbreviate entries and use the program to convert each abbreviation into its full-text equivalent. When you type an abbreviation, you can press a predesignated key, known as a hot key, that makes the program replace the abbreviated entry with the full-length one.

Spreadsheet Shorthand isn't the only macro program with such powers, nor is it the best. The venerable *Keyworks* (Alpha Software, Burlington, Mass.), in version 3.0 at the time of this review, is simpler to use, provides more options, and costs about the same when ordered by mail.

EASY MACROS

Spreadsheet Shorthand makes it easy to create macros. Instead of writing the macro, you can have the program record your keystrokes as you type and as you enter commands. When you end the current session with *Spreadsheet Shorthand*, the program automatically stores in a separate file any macros you created. This prevents you from losing your macros if you forget to save them before ending the session.

As do most macro programs, *Spreadsheet Shorthand* comes with some predeveloped macros. The program includes 130 macros designed for use with *1-2-3*, but many of them are either difficult to use or easy to misuse. For example, the instructions don't tell you that when you use the macro that transforms a date entry into a *1-2-3* @DATE function, you must enter the year without the century digits (for example, *88* instead of *1988*) and the month as a number. Another macro lets you hide notes on the worksheet, but in doing so it inserts new columns without warning you. That could be dangerous.

The package does contain some useful macros. One macro displays a ruler so that you can easily establish the print width of a range. Another macro automatically creates a name-and-address database, and yet another simplifies entering numbers in successive columns. Nonetheless, there aren't enough gems in this group of macros to justify the search for them.

The program lets you store abbreviations in abbreviation dictionaries. A predeveloped dictionary comes with the program. If you are using one of these dictionaries and you type an abbreviation and press a hot key, *Spreadsheet Shorthand* replaces the abbreviation with the appropriate keystroke sequence that is in the dictionary. The replacement could be simple, such as substituting *Dear Mr.* for the abbreviation *DMR*, or it could be more complex. For example, if you enter *sum* and press a hot key, *Spreadsheet Shorthand* could enter *@sum(* and pause for you to enter a range. Then it would enter the closing parenthesis to complete the formula. Abbreviations like this help you build worksheets more quickly.

Creating and modifying a dictionary are easy. The program contains an editor with which to modify or write entries, and the dictionary stores items in alphabetical order, making it easy to locate individual entries.

One of the program's strengths is the ease with which it lets you control the capitalization of the text that replaces an abbreviation. In most macro programs, if you want the same word to appear once with only an initial uppercase letter, once with all uppercase letters, and once in all lowercase letters, you need three dictionary entries. In *Spreadsheet Shorthand*, one entry suffices. As you type the abbreviation, you can specify the capitalization of the entry that will appear on the worksheet. You simply enter the abbreviation in the same case that you wish the entry to assume.

IS KEYWORKS BETTER?

Spreadsheet Shorthand lets you create menus that provide access to your macros, and it also allows you to produce help screens that explain the function and use of the macros. Those capabilities may embolden you to create sophisticated turnkey applications. If you

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decide to do so, you'll run into two challenges.

First, *Spreadsheet Shorthand* macros can be no longer than 354 characters. If your application requires a macro that has more characters than that, you'll have to use the awkward solution of writing separate macros and linking them together. A *Keyworks* macro can be as much as 9,500 characters in length.

Second, building menus requires you to master a syntax that's as exacting as the one that governs *1-2-3* macros. By way of comparison, *Keyworks* lets you create menus and help screens more easily with a process that involves menus and fill-in-the-blanks forms. Furthermore, *Keyworks* lets you select the size and position of those menus and help screens; *Spreadsheet Shorthand* does not. That capability will be important if you need to view a worksheet range at the same time the menu or help screen is displayed.

Neither program measures up to the programming power available through *1-2-3*'s or *Symphony*'s native macros. However, if you have *Keyworks* and need to write programs, you can purchase *Keyworks Advanced*, which does contain a programming language, yet lets you use your existing macros. No such option exists if you use *Spreadsheet Shorthand*.

Even when you perform mundane tasks using macros, *Spreadsheet Shorthand* takes a backseat to *Keyworks*. Recording a macro, for example, requires a lengthier and more-awkward series of keystrokes in *Spreadsheet Shorthand* than in *Keyworks*. Thus, if you need to use macros other than those you can write in *1-2-3* or *Symphony*, consider *Keyworks* or *Keyworks Advanced*. ■

IN BRIEF

Spreadsheet Shorthand Version 2.0. Bi-Intelligence, 210 East 86th St., Suite 501, New York, NY 10028; 212-439-6900. Runs on the IBM PC, PC XT, PC AT, PS/2 series, the Compaq 386, and compatible computers. Requires DOS 2.0 or higher and a minimum of 256K of RAM. Released 4/88. $65. Includes a library of macros compatible with *1-2-3* Releases 1A and 2/2.01, *The Twin*, *Surpass*, *Quattro*, and all versions of *VP-Planner*. A version of the macro library is available for *Symphony*. Not copy-protected; 30-day, money-back guarantee.

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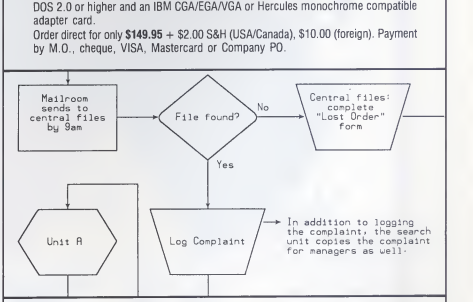
- **Fast:** Written in assembly language for speed.
- **Large:** Charts up to 417 columns wide by 225 lines high. Chart too large for your printer? EASYFLOW automatically breaks the chart up & prints it in page size pieces.
- **Standard:** All standard flowcharting shapes included. Custom shapes can be ordered.
- **User friendly:** Don't take our word for it. PC Magazine says "*EASYFLOW lives up to Its name. It's hard to imagine any easier and more flexible way to produce basic and even complex flowcharts*". [March 10th 1987 issue, page 278.]
- **Mouse:** Optional but fully supported.
- **It prints:** On most popular matrix printers including IBM, Epson, Toshiba, HP LaserJet, LaserJet-Plus and many others.
- **It plots:** On HP7440, 7475, 7550, 7570, 7585B and compatible plotters.
- **It works:** We are contractually prevented from mentioning the name of the "big eight" accounting firm that purchased a world-wide site license, but we can tell you that they spent months evaluating all available flowcharting packages before choosing EASYFLOW.
- **Rush delivery:** Order by noon today (eastern time) and you'll have it tomorrow. Rush delivery charge is $10.50 (instead of $2.00) and is available only to continental USA and Canada.
- **Documented:** 100 page manual plus over 150 screens of context sensitive help.

EASYFLOW works on IBM PC's, IBM PS/2 and compatibles. Requires 384 K memory, DOS 2.0 or higher and an IBM CGA/EGA/VGA or Hercules monochrome compatible adapter card.

Order direct for only **$149.95** + $2.00 S&H (USA/Canada), $10.00 (foreign). Payment by M.O., cheque, VISA, Mastercard or Company PO.



The chart fragment above was produced on an HP LaserJet-Plus and is actual size and unretouched. Publication quality charts like this can be produced using only minutes of preparation time and seconds of print time.

HavenTree Software Limited
PO Box 1093-E
Thousand Island Park, NY 13692

Order Desk: 1-800-267-0668
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CIRCLE 129 ON READER SERVICE CARD

You don't need a lot of experience either. Because only PFS: First Graphics gives you so many charting options in such an easy to use package. And at such an easy to live with price. You'll get direct read of your Lotus files for faster generation of pie charts, bar charts and text charts. And you'll get them with more fonts and more sophisticated looking output than any other graphics package in its price range. So, for charts that will impress others, at a price that will impress you, get PFS: First Graphics. It's as easy as pie.

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Discus Rewritable Stores 650 Megabytes on a Removable Disk

If you've been waiting for an optical-disk drive that you cannot only write to but erase, it's here. AGA's Discus Rewritable uses removable, rewritable optical-disk cartridges that store 650 megabytes each. Because the drive reads one side of the disk at a time, you always have access to 325 megabytes. To use the other side, you remove the cartridge, turn it over, and reinsert it.

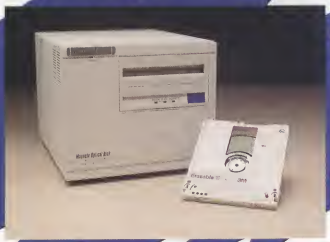
Part of the drive's appeal is that it behaves like a standard hard disk. To install it, plug an adapter card into an empty slot in your computer, connect a cable from the computer to the Discus drive, copy a file onto your hard disk, and add a line to your CONFIG.SYS file. After that, you can start up from the drive, partition it, write files to it, copy files to and from it, and otherwise treat it like any other drive.

Discus Rewritable puts your data at less risk than a hard disk does. An optical disk isn't subject to such common hard-disk problems as head crashes, where the drive head physically crashes into the disk, and data corruption from stray magnetic fields. The cartridge is also supposed to be quite durable. The cartridge manufacturer, 3M, claims to have tested it through more than a million rewritings without observing any degradation of performance or signs of wear.

The unit has weaknesses, however. It isn't fast. Discus Rewritable requires an 80286- or 80386-based computer, but its disk-access time of 84 milliseconds makes it only about as fast as a typical IBM PC XT hard-disk drive. And the unit is expensive initially. At $4,995 for the drive, a cable, the adapter card, and one 650-megabyte removable cartridge, it costs more than many 80286-based computers. When the Discus Rewritable fills up, however, Discus delivers a whopping savings. An additional 650-megabyte cartridge costs $250.

—Michael Pandolfo and Marc Davidson

AGA, 90 Fifth Ave., New York, NY 10011-7696; 212-337-4200. Runs on an 80286- or 80386-based computer with DOS 3.0 or higher. The company plans to ship drivers for OS/2 and DOS 4.0 with the product. $4,995; 90-day warranty.



Optical disks, used in audio compact disk players and in compact disk read-only memory (CD-ROM) devices, have found a new role as full-function mass-storage devices.

CIRCLE 1 ON READER SERVICE CARD

Information for New Products is supplied by the vendors and was up to date as of 9/13/88. Since production specifications change frequently, we recommend that you verify this information with a dealer before making a purchase.

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Reader Service Number	Advertiser	Page
119	Ashton-Tate	46–47
—	AST Research	65, Cover 4
—	AT&T	79, 81, 83
116	Banner Blue	39
114	Best Programs	29
124	Business Week	78
127	Cambridge Direct	88
117	Charles Schwab & Co.	41
—	Compaq Computer Corporation	33–36
118	Computer Associates International Inc.	42–43
125	Computer Associates International Inc.	82
123	Concentric Data Systems Inc.	76
122	Datavue	71
—	Dow Jones	85
115	Frontline Systems Inc.	31
101	Funk Software	Cover 2
129	HavenTree Software Ltd.	107
102	Insight Development	3
111	Intel Corporation	20–21
107	Intex Solutions Inc.	14
108	Intex Solutions Inc.	14
126	Intex Solutions Inc.	84
131	Lightning Word Corporation	115
—	Lotus Development Corporation	8, 19, 23, 25, 102–103
103	MARQ Technologies	4–5
—	Maxell Corporation of America	15
128	MECA (Micro Education Corporation of America)	93–95
—	Microsoft Corporation	13, 86–87
—	Oracle Corporation	97
112	Park Technologies Inc.	22
106	Personics Corporation	11
132	Personics Corporation	117
104	Resource Analysis International	6
105	SB Associates Inc.	7
—	Software Publishing Corporation	108
134	Softway Inc.	116
109	Spectrum Computer Consulting	17
121	SPSS Inc.	53
133	STSC Inc.	Cover 3
120	Toshiba America Inc.	48
113	Verbatim Corporation	27
110	VeriComp	18
130	Zenith Data Systems	113

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To receive more information about products and services advertised in this issue, please use one of these Reader Service cards. Just circle the numbers on the card that correspond to the Reader Service numbers on advertisements and new product announcements, and drop the postage-paid card in the mail.

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16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130	131	132	133	134	135
136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160	161	162	163	164	165
166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
181	182	183	184	185	186	187	188	189	190	191	192	193	194	195
196	197	198	199	200	201	202	203	204	205	206	207	208	209	210

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130	131	132	133	134	135
136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160	161	162	163	164	165
166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
181	182	183	184	185	186	187	188	189	190	191	192	193	194	195
196	197	198	199	200	201	202	203	204	205	206	207	208	209	210

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Article No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Excellent	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Good	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Fair	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Poor	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
N/A	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

TELL US HOW WE DID

The editors of *LOTUS* would appreciate your evaluation of the articles in this issue. This is easier than it may appear.

1 Get the assigned number for each article from the Editorial Evaluation list on the facing page.

2 Find the article's number in the top row of the evaluation section of the card.

3 Circle the number that reflects your evaluation. If an article did not interest you at all, circle number 5 in the N/A row.

We encourage you to comment on, as well as evaluate, the contents of this issue. Thanks in advance.

NEW PRODUCTS

Pop-up Program Saves Time and Memory, Lets You Use the Same Macro in Many Spreadsheets

SPREADSHEET SHORTHAND is a terminate-and-stay-resident program for creating macros that run with all *1-2-3*, *Symphony*, *VP-Planner*, *The Twin*, and *Quattro* spreadsheets. The program either records your keystrokes or guides you as you create a macro. Macro names can be up to seven characters long. You can create macros to call up other macros, and you can add notes to any macro. The program includes 130 macros that let you copy a column or cell to the left or right, put the date in a cell, and erase or recalculate a range.

The pop-up program uses 98K of RAM and runs on the IBM PC, PS/2, and compatible computers. It costs $65, from Bi-Intelligence, 210 East 86th St., Suite 501, New York, NY 10028; 212-439-6900. For more information, see the review of *Spreadsheet Shorthand* in this issue.

CIRCLE 2 ON READER SERVICE CARD

Laser Font Cartridge Lets You Print 240 Characters per Line in Portrait and Landscape Modes

SPREADSHEET is a font cartridge that lets you fit a large amount of worksheet data on one printed page that retains clarity when you photocopy it. You can choose from five type sizes that range from 3.6 to 10 point. The utility runs with all versions of *1-2-3* and *Symphony* or any program that supports a Hewlett-Packard font cartridge.

The printer utility runs with all HP LaserJet printers and Canon SX-engine–based laser printers. It costs $199, from Pacific Data Products, 6404 Nancy Ridge Dr., San Diego, CA 92121; 619-552-0880.

CIRCLE 3 ON READER SERVICE CARD

EDITORIAL EVALUATION

Your comments about *LOTUS* magazine help us bring you the best editorial product each month. To rate the articles in this issue, scan the list below and refer to the EDITORIAL EVALUATION card on the bottom of the insert to the left. Identify the number corresponding to each article, then circle the number on the card that reflects your rating.

NUMBER	TITLE	PAGE
1	IDEAS & TRENDS	9
2	1-2-3 MACROS Menu Alternatives	28
3	SYMPHONY MACROS Getting Around	37
4	ACCOUNTING Keep Afloat with a Sinking Fund	44
5	PERSONAL FINANCE When 10% Isn't 10%	49
6	FEATURE 4 Job Schedules	54
7	FEATURE *Agenda*: 'It Works the Way I Think'	60
8	FEATURE Analyze Your Database . . . Selectively	66
9	FEATURE Don't Squander Memory	72
10	Q&A	77
11	GOOD IDEAS	89
12	DATA TRANSFER *Hot Line Two* and *Lotus Express*	96
13	REVIEW *Bookmark*, *Maxi*Save*, and *SOS*	100
14	REVIEW *Oracle for 1-2-3*	104
15	REVIEW *Spreadsheet Shorthand*	106
16	NEW PRODUCTS	109
17	ESSAY Predicting Election Results with *1-2-3*	118

AND COMING NEXT MONTH:

- **Make Decisions with Binomial Distribution**
- **Accounting: Spotting Trends with Mini Graphs**
- ***1-2-3* Macros: Mail Call**

Low-Cost Integrated Package Works with All Versions of 1-2-3

CRUNCHER combines spreadsheet, database, and graphics modules. The program lets you add notes to cells that you can hide or not hide when you print the spreadsheet. An auditing feature traces cell references and finds circular references. The software includes four types of graphs, which you can print by specifying them from the spreadsheet or by holding down the Shift key and pressing PrintScreen. It reads and writes worksheet files.

The program runs on the IBM PC, PS/2, any Tandy, and compatible computers with 384K of RAM and one disk drive; a hard disk is recommended. *The Elements of Spreadsheet Style* by John M. Nevison is included. The software costs $99.95, from Simon & Schuster Software, 200 Old Tappan Rd., Old Tappan, NJ 07675; 800-624-0023, in N.J. 800-624-0024.

CIRCLE 4 ON READER SERVICE CARD

Five Accessories Enhance Harvard Graphics Presentations and Reports

SCREENSHOW UTILITIES ($149) lets you capture screens for making slides, produce a slide show to run on a PC, and copy or move a slide show and its charts from one disk or subdirectory to another. *Quick-Charts* ($99) is a template of 125 business charts and graphs. *Business Symbols* ($99) adds 300 symbols to the 300 that *Harvard Graphics* already provides. *Designer Galleries* ($99) provides on-disk advice from graphic-design professionals. *U.S. MapMaker* ($149) reproduces an outline of any state and will position any city within it.

The five accessories run with *Harvard Graphics* Versions 2 and 2.1 on the IBM PC, PS/2, and compatible computers with 512K of RAM and a hard disk. They are from Software Publishing Corp., 1901 Landings Dr., Mountain View, CA 94039-7210; 415-962-8910.

CIRCLE 5 ON READER SERVICE CARD

Program Assists with Cash Flow Planning for Individuals

TAXCALC CASH FLOW PLANNER is a *1-2-3* template that helps financial planners project cash flow for individual clients. To the client's financial information from the IRS form 1040, you add such nontax expenditures as mortgage and utility payments. The program projects cash flow for the current period, as well as for 12 months and 5 years into the future. You can vary scenarios to find the maximum cash flow yield.

The template runs on the IBM PC, PS/2, and compatible computers with 640K of RAM. It costs $150, from TaxCalc Software, 4210 West Vickery, Fort Worth, TX 76107; 800-527-2669, in Tex. 817-738-3122.

CIRCLE 6 ON READER SERVICE CARD

CURT BERNER

1-2-3 Template Simplifies the Preparation of Sales Tax Returns

SALESTAX PC RETURNS lets you import data from a mainframe billing system, then calculate your sales tax obligations. The template includes 45 states (not included are New Hampshire, Montana, Oregon, Delaware, and Alaska), all local jurisdictions where the state collects for the locality, and the District of Columbia. And it lets you print statements that comply with many states' regulations.

The sales tax program requires *1-2-3* Release 2/2.01 and runs on the IBM PC, PS/2, and compatible computers with a hard disk and 640K of RAM. A base price of $2,900 plus $60 to $180 per state, depending on the state, includes monthly updates for one year; a version that includes all states plus the base subscription costs $7,776. It's from Vertex Systems, 1041 Old Cassatt Rd., Berwyn, PA 19312; 215-640-4200.

CIRCLE 7 ON READER SERVICE CARD

CURT BERNER

CIRCLE 130 ON READER SERVICE CARD →

STATE OF THE A T.

ZENITH UNVEILS THE AT®-COMPATIBLE COLLECTION.

ZENITH INNOVATES AGAIN—Zenith's collection of AT compatibles began with the Z-386.™ An introduction that ushered in such industry firsts as zero wait states, cache memory and slushware—for greater speed and faster memory access. Once again, Zenith's constant pursuit of innovative, user-relevant technology has created faster, better computers.

The new Z-248/12™ and Z-286 LP™ desktop PCs. Two new master-strokes that respond to today's need for smaller size and maximum expansion. Two more reasons why Zenith is the leading supplier of AT-compatible systems.

The compact Z-286 LP combines a four-inch low profile and space saving small footprint with performance you'd expect from a unit three times its size.

The Z-286 LP comes standard with 1MB RAM—expandable to 6MB without using an expansion slot. Generous memory capacity to run new MS OS/2™ applications. And with a single 3.5" floppy and fast 40MB hard disk you have truly impressive storage capacity.

The Z-248/12 is among the fastest 286 systems available. Its zero wait state design magnifies its 12MHz to speed past 16MHz systems with wait states.

® AT is a registered trademark of IBM Corp.

™ MS OS/2 is a trademark of Microsoft Corp.

The Z-248 is also standard with 1MB RAM and is expandable up to 6MB without using an expansion slot. However, four open expansion slots can artfully handle future growth. Configurations of 5.25", 3.5" floppy or 40, 80 and 160MB hard disks truly expand all your options.

All systems are available with Zenith's revolutionary Flat Technology Monitor (shown above) and VGA-compatible video card for ultimate video performance.

With breakthrough after breakthrough, these new computers are yet further proof that Zenith's AT-compatibles define the State of the Art. See the "AT Collection" now showing at your Zenith Data Systems authorized dealer. For your nearest location call: 1-800-553-0350.

ZENITH | data systems

THE QUALITY GOES IN BEFORE THE NAME GOES ON®

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Harvard Project Manager Update Has Easy-to-Use Data-Entry Screen, Imports and Exports 1-2-3 and dBase Data

HARVARD PROJECT MANAGER 3.0 builds Pert charts, Gantt charts, work outlines, and task lists. You enter data from a project-overview screen; menu selections let you import and export data from all versions of *1-2-3* and *dBase* and from ASCII files. You can scale reports from 10% to 200% of the original size and batch them for printing. The program supports extended memory, an EGA card for 43-line display, and E-size plots, which are 3 feet by 4 feet in size. A calendar reflects any change in the availability of resources, including people and equipment.

The update uses 512K of RAM and runs on the IBM PC XT, PS/2, and compatible desktop, portable, and laptop computers with a hard disk. It costs $695, from Software Publishing Corp., 1901 Landings Dr., Mountain View, CA 94039-7210; 415-962-8910.

CIRCLE 8 ON READER SERVICE CARD

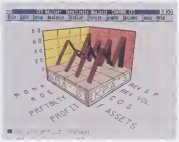
Program Runs as a 1-2-3, Framework, and Quattro Add-in or as a Stand-alone Printer Utility

TWIST & SHOUT provides three basic functions: printing sideways, producing banners, and spooling printer operations. The program has 4 fonts in 15 sizes and 50 symbols, prints 240 lines per page, and supports color cards and mice. It spools to either a floppy disk or hard disk and runs in the background. It runs as an add-in to *1-2-3* Release 2/2.01, *Framework II* and *III*, and *Quattro* or as a stand-alone program with any release of *Symphony, VP-Planner*, and *Microsoft Word*, and with most text and all ASCII files.

The utility uses 384K of RAM as a stand-alone program or 60K as an add-in and runs on the IBM PC, PS/2, and compatible computers. It works with any dot-matrix printer, including color, and most laser and ink-jet printers. It costs $59.95, from Software Toolworks, 13557 Ventura Blvd., Sherman Oaks, CA 91423; 818-907-6789.

CIRCLE 9 ON READER SERVICE CARD

Windows-based Software Streamlines Corporate Financial Analysis Linked to Active Data



CFO ADVISOR computerizes 75 key financial measures based on the financial-analysis formula developed at E. I. du Pont de Nemours & Co. You can import data from general-ledger systems or from *1-2-3, Microsoft Excel*, or *SuperCalc 4* spreadsheets to review your position or make projections. The program lets you analyze figures by product lines, divisions, and aggregated and detailed levels. You can produce two- and three-dimensional bar graphs and pie charts to compare real-time data.

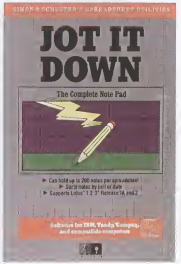
The program includes a version of *Microsoft Windows* and runs on the IBM PC XT, PS/2, Compaq Deskpro 386, and compatible computers with 640K of RAM, DOS 3.0, and a hard disk. It costs $995, from Financial Feasibilities, 345 North Maple Dr., Suite 190, Beverly Hills, CA 90210; 800-752-5556, in Calif. 800-247-4452.

CIRCLE 10 ON READER SERVICE CARD

Utility Lets You Add 200 One-Line Notes to Your Spreadsheets

JOT IT DOWN is a terminate-and-stay-resident utility that lets you keep track of assumptions behind entries in your spreadsheet cells. You can save up to 200 notes per spreadsheet by date, formula value, or label. The program runs with all versions of *1-2-3, Symphony*, and compatible spreadsheets.

The utility uses 128K of RAM and runs on the IBM PC, PS/2, and compatible computers with DOS 2.1 or higher. It costs $49.95, from Simon & Schuster Software, 200 Old Tappan Rd., Old Tappan, NJ 07675; 800-624-0023, in N.J. 800-624-0024.



CIRCLE 11 ON READER SERVICE CARD

1-2-3 Template for Small Businesses Keeps Basic Client Information and Prints Mailing Labels

CLIENT DATABASE lets you record standard items for up to 2,000 clients. Entries include name, phone number, company, address, profession, and remarks. You can quickly find database entries by entering a shortened character string that ensures a unique match. The software

lets you print mailing labels from the database.

The program requires *1-2-3* Release 2/2.01 and runs on the IBM PC, PS/2, and compatible computers with 512K of RAM. It costs $25, from Compusense, 103 Village Dr., Avenel, NJ 07001; 201-396-9291.

CIRCLE 12 ON READER SERVICE CARD

File-Compression Utility Frees Up Space on Hard Disk and Floppies

DS SQUEEZE allows you to reduce the size of your text, graphics, and spreadsheet files by 40% to 96% and your COM and EXE program files by 10% to 25%. File compression frees up memory for other uses, and it enables you to send files via modem quickly if the receiver has the utility to decompress the files. The program archives files and produces a directory that lists each file's name and number of kilobytes before and after compression. You can attach 15 lines of remarks to each file.

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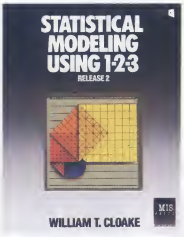
Book for Experienced 1-2-3 Users Covers Models and Statistical Techniques

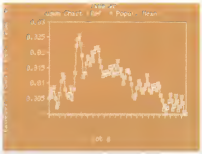


STATISTICAL MODELING USING 1-2-3 RELEASE 2.0, by William T. Cloake, guides you through writing complex macros. Step-by-step instructions help you build templates that enter, import and export data to and from spreadsheets, pass data from one model to another, and produce reports. Cloake discusses his own data-organization approaches, as well as popular techniques such as statistical process control.

The 544-page paperback costs $22.95; models from the book are available on disk for an additional $20. It's from MIS Press, P.O. Box 5277, Portland, OR 97208; 800-626-8257, in Oreg. 503-222-2399.

CIRCLE 14 ON READER SERVICE CARD

1-2-3 and Symphony Template Produces Charts for Statistically Based Quality Control



SPC ORCHESTRA lets you carry out statistical process control, the technique that analyzes production, manufacturing, and administrative processes through their pattern variations. You can generate histograms and Shewhart X-bar, cumulative-sum, range-control, moving-average, and moving-range charts. The program automatically enters graph titles and suggests PIC-file names based on column headings.

The template requires *1-2-3* Release 2/2.01 or any version of *Symphony* and runs on the IBM PC, PS/2, and compatible computers with 448K of RAM. It costs $195, from D. A. Martin, 1630 Winding Ridge Trail, Knoxville, TN 37922; 615-675-6488.

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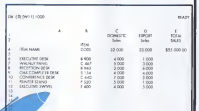

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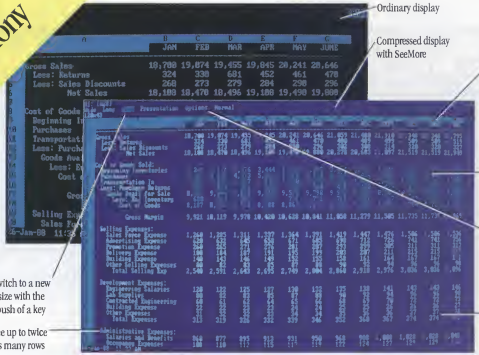
The utility uses 512K of RAM and runs on the IBM PC, PS/2, and compatible computers and with most dot-matrix and Hewlett-Packard LaserJet printers. It costs $150, from Pyxel Applications, 2917 Mohawk Dr., Richmond, VA 23235; 804-320-5573.

CIRCLE 16 ON READER SERVICE CARD

For 1-2-3 and Symphony



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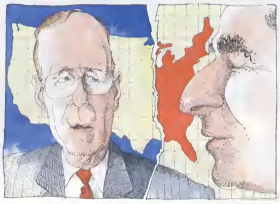
CIRCLE 132 ON READER SERVICE CARD

PREDICTING ELECTION RESULTS WITH 1-2-3

BY DANIEL SELIGMAN

We begin with an apology. Unexpected programming snags delayed the release of this Electoral College Forecaster. While tardy program introductions are certainly in the tradition of the computer industry, this particular delay is most regrettable because the product is being unveiled only a few days before the main event on November 8. *LOTUS* readers who get stuck in the front of the book may never even read about our breakthrough before the magic moment when Tom Brokaw projects the winner, and at that point, who needs forecasting software, however dazzling it may be.



The electoral college and computers have a natural affinity. U.S. presidential elections are a game of staggering complexity. Election forecasters need to know about 51 jurisdictions, with electoral votes that range from 3 to 47. The total number of electoral-vote combinations equals 2 to the 51st power, plus 2, or 2,251,799,813,685,250. There are 1,117,023,032,954,833 combinations that will give the winning candidate the required 270 or more electoral votes and 17,753,747,775,586 combinations by which the candidates can tie (each getting 269 votes).

To create an Electoral College Forecaster with *1-2-3*, proceed as follows. In column A, list the 50 states and the District of Columbia, alphabetically or otherwise. In column B, list the number of electoral votes for each jurisdiction. And in column C, adjacent to each electoral vote, put down a number from Ø to 100, representing your estimate of the percentage probability that Bush (or Dukakis) will win in this jurisdiction.

We then use column D to simulate a presidential election. Our formula generates a random number from 1 to 100 and compares it with the probability in column C. For example, say you've given Bush a 54% chance (in cell C2) of winning Alabama (in cell A2). If the random number generated by the following formula (in cell D2) turns out to be 54 or less, then Bush gets the state's 9 electoral votes (in cell B2); otherwise, he gets Ø.

```
@IF((@INT(@RAND*100)+1)
  <=C2,B2,Ø)
```

This formula is copied down through the other 50 rows, and the resulting output is summed at the bottom. If the sum is over 269, Bush (or Dukakis) has won the election. A single election does not prove a lot, of course; luck would be too large a factor. In a single election, Bush might even carry the District of Columbia (where we charitably rate his chances at 10%). Thus the Electoral College Forecaster assumes you will run the program enough times, say 10,000, so that the laws of statistical sampling produce a valid result.

The program includes another @IF formula that tracks the probability of either candidate's winning the election without winning California. It turns out not to be easy. It also includes a macro with a {GETNUMBER} command that enables you to specify enough runs to get a handle on the overall electoral probabilities. On our own Dell System 200, it takes about a half hour to knock out 10,000 simulations.

You are possibly muttering to yourself about the difficulty of getting those estimates you need for column C. OK, life would be simpler if Las Vegas supplied a betting line on each state, but unfortunately, elections are one of the things you cannot legally bet on in Nevada. The legislators there have cloudily reasoned that if it were legal, gamblers might "fix" elections.

Luckily, however, the volume of state-by-state surveys has been increasing. As early as August, you could get a rough line on every state (in the August 29/September 5 issue of *U.S. News & World Report*, for example). And *The Chicago Tribune* has run polls in five critical states: California, New York, Texas, Illinois, and Florida. The Presidential Campaign Hotline, based in Virginia (703-442-0819), keeps a close watch on all state polls. To be sure, these poll results still leave you with a problem that is ultimately somewhat subjective: turning the poll data on a state into a percentage probability that your candidate will win it.

Our last round of 10,000 simulations, run in September, showed Bush winning 6,001 of the elections, Dukakis winning 3,932, and 67 ties. This means Bush is a fair bet at 3 to 2. The data also suggest that California, which we rated a toss-up at 50%, is critical for both candidates. Without the Golden State, Bush won only 1,989 times, Dukakis only 957 times. ■

Daniel Seligman writes Fortune *magazine's "Keeping Up" column.*

JOE CARDELLO

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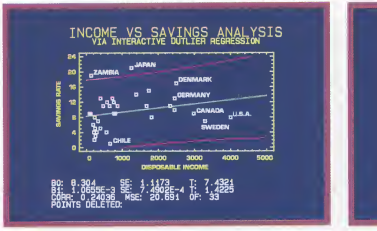

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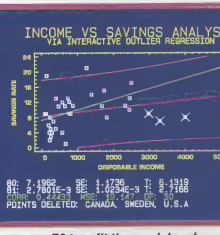

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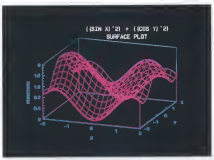

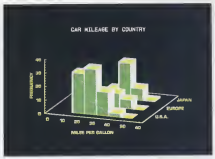

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